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Toward a Theory of Equitable and Efficient Accounting Policy

Baruch Lev

ABSTRACT: Inequity in capital markets, defined here as inequality of opportunity or the existence of systematic and significant information asymmetries across investors, leads to adverse private and social consequences: high transaction costs, thin markets, lower liquidity of securities, and in general, decreased gains from trade. Such adverse consequences of inequity can be mitigated by a public policy mandating the disclosure of financial information in order to reduce information asymmetries.

The equity-orientation of disclosure regulation advanced here differs markedly from the traditional, moralistic concepts of equity in accounting, which are generally phrased in terms of maintaining fairness, eliminating fraud, and protecting the uninformed investors against exploitation by insiders. In contrast to such vague, anachronistic, and unattractive notions, the equity concept advanced here is state of the art and operational, being linked directly to recent theoretical developments in economics and finance. As such it provides an economically sound justification for disclosure regulation, and furthermore, it offers accounting policymakers an operational "public interest" criterion for disclosure choices and opens up to researchers a rich agenda for evaluating regulation consequences.

DESPITE extensive research effort in recent decades, satisfactory answers to the fundamental questions concerning the operations and social consequences of accounting regulation still elude us.[1] Particularly intriguing is the question of "why regulation?" What justifies the strict prescriptions regarding the production and dissemination of corporate financial information in the U.S., and to varying degrees in practically all free-market economies? The absence of a compelling justification is manifested, for example, by repeated arguments that such regulation is redundant, since managers have sufficient incentives to disclose voluntarily financial information, or that the existing regulation is ineffective in achieving socially desired goals (e.g., Ross [1979], Grossman and Hart [1980], Benston [1976 and 1979], and Watts and Zimmerman [1979]). Particularly noteworthy is the fact that accounting regula-

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[1] The term "accounting regulation" refers throughout this study to the existing laws, rules, and generally accepted accounting principles concerning the timing, content, and form of periodic (e.g., quarterly and annual) corporate financial reports; other kinds of required filings (e.g., prospectuses and S-8 disclosures); and to the regulations regarding the verification of disclosed information, namely public accounting (auditing).

Helpful comments and suggestions were obtained in particular from James Ohlson, and also from Yakov Amihud, William Baumol, Sidney Davidson, Avner Kalay, William Kinney, Haim Mendelson, Artur Raviv, Bret Trueman, and participants of the Stanford Summer Accounting Workshop and Workshops at Columbia and Tel Aviv Universities. I am deeply indebted to all.

Baruch Lev, University of California–Berkeley and Tel Aviv University.

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tory institutions rarely address in their deliberations and pronouncements, the issue of justifying regulation. A typical example is the FASB's effort to outline the basic concepts and objectives of accounting—the "conceptual framework" project [FASB, 1974, 1976a and b, 1978]. The question of "Why regulation?" was not even raised in the various discussion memoranda, exposure drafts, and statements emanating from this project.

Statements on accounting objectives and procedures generally start from the premise that investors and lenders *use* financial information to make economic decisions, and go on to assume that the mandated provision of such information will improve the allocation of resources. However, even if the usefulness of information is taken for granted, this does not necessarily imply that its disclosure should be *mandated*. Bread, housing, art, books, and, in many countries, higher education satisfy important needs of wide groups of "users," yet the quantities provided and the timing of provision of such goods and services are not mandated by public institutions in the strict manner that financial information is.[2] It might be that the characteristics of information are inherently different from those of other goods and services, creating the need for stricter regulation of the former. Yet, even in the context of widely needed information, the regulation of financial disclosure is unique; why, for example, is such important information as the performance record of doctors, lawyers, and stockbrokers not required to be publicly disclosed and certified in the manner that corporate records are? Thus, a logical link is missing between assuming that financial information is useful and calling for mandated and closely regulated disclosure; usefulness is a necessary but not a sufficient condition for disclosure regulation.[3]

The "why regulation?" question is not the only intriguing one; additional policy questions abound. For example, the FASB repeatedly contends (e.g., [1976b, p. 163]) that the choice of the basic principles and detailed practices governing the disclosure of financial information should be guided by "a standard that specifies the public interest." But, what is this standard? Usefulness of information, a frequently mentioned criterion, is clearly an inadequate standard in a "multi-person" setting of many users with varied preferences and objectives, since usefulness depends on the characteristics of the specific users of information and on their decision environments. What is highly useful information for some investors might be irrelevant or even damaging (e.g., proprietary information) for others. So, what public interest criterion *does* and/or *should* determine the choices made by accounting regulators? Or, yet another largely unanswered policy question—how should the social consequences of accounting regulation be evaluated and the effectiveness of these policies determined? Even within the empirical stock market-based research paradigm so widely used by researchers, implications for social desirability can be drawn only under very strong assumptions (see Lev and Ohlson [1982, section 3.1]). It is not clear whether other research methods (e.g., laboratory experiments) will be more successful in evaluating accounting regulation consequences.

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[2] Laws regulating the *quality* of products (e.g., housing codes) are, of course, prevalent. But such regulations do not, in general, stipulate the *quantities* of goods to be produced and the *timing* of deliveries. The Securities laws, on the other hand, stipulate both the quality (e.g., the audit requirement) and the quantity (scope of disclosure and timing) of information to be released by firms. In this sense the regulation of financial information is much stricter and more comprehensive than regulations pertaining to other goods and services.

Moreover, several recent regulations by the SEC appear to have been aimed at affecting the *conduct of firms*, and not only to assure proper disclosure. Such a use of disclosure power to achieve substantive results is evident, for example, in the required disclosures bearing on the independence of corporate board members and management compensation. Such disclosure requirements probably had substantive effects on the compositions of boards (e.g., increasing the number of outside members), and on the structure of management compensation systems. For elaboration on these substantive aims of disclosure regulations, see Cohen [1981].

[3] To be sure, various attempts have been made to justify disclosure regulation on the basis of alleged "market failures," or to ascribe its existence to regulators' selfish motives or to "historical accidents." I will elaborate in Section III on these regulatory explanations and why I find them unsatisfactory.

One must conclude, therefore, that despite increased awareness of the issues involved, little progress has thus far been made in addressing the basic accounting policy issues. In fairness, similar criticism can be levelled at most other (non-accounting) forms of regulation and government interventions for which the justification and social consequences are not well established. Indeed, it might be the case that some of the obstacles preventing a clearer understanding of the above policy issues are not unique to accounting regulation. Nevertheless, this does not diminish the relevance of these issues for accountants, particularly given the major impact of disclosure regulation on the development of accounting research and practice.

I argue below that progress in addressing the fundamental accounting policy issues can be achieved by expanding the scope of analysis to include an explicit concern of policymakers—*equity* in capital markets:

> Persons who design public policy are, typically, at least as concerned with issues of equity as with allocative efficiency. The economist's influence is therefore impeded by his inability to deal with issues of fairness in applied problems. [Baumol, 1982, p. 639]

Equity is defined in this study (Section I) as equality of opportunity—an equal access to information relevant for asset valuation. Or, in the more familiar parlance—a state of symmetric distribution of information across investors. Equity considerations obviously extend beyond the Pareto concepts which traditionally guide economic and accounting researchers in the study of policy issues.[4] It will be argued (Section II) that *in*equity in capital markets resulting from information asymmetry can and does occur, and that its social consequences in the form of high transaction costs, thin markets, low liquidity and, in general—decreased gains from trade, are indeed very undesirable. This will lead to the formulation of an equity-oriented accounting policy which will provide the justification for mandating the disclosure of financial information (Section III). Furthermore, this equity objective appears to provide policymakers with a clearer, more operational "public interest" choice criterion than currently exists (Section IV), and opens to researchers an agenda for the study of policy effectiveness and the evaluation of social consequences (Section V).

It should be pointed out at the outset that the equity orientation presented here is not a traditional call for fairness or for defending the "small investors" against fraud and exploitation by insiders. Unconvincing motivations for regulation, such as falsely portraying individual investors as defenseless, effectively dampened the interest of most researchers in equity issues. In contrast, the equity concerns presented here are linked directly to recent, important finance and economic theoretical developments, and as such, provide a rich foundation for equity-oriented research.

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[4] A characteristic example is Watts [1980, p. 153], who defines the "public interest" objective of accounting regulation in terms of Pareto efficiency: "I shall define public interest in the manner long used by economists and some politicians, namely, as Pareto optimality or economic efficiency."

I. EQUITY AND INFORMATION DISTRIBUTION

There is a vast literature exploring equity, fairness, and justice concepts generated primarily by philosophers (for surveys, e.g., Sen [1970, ch. 9] and Rawls [1971]). Recently, various concepts of equity have been discussed in the economics literature and analytically integrated into models and theories. Notable among these are the justice principles of Rawls [1971] and Foley's [1967] equity-as-no-envy concept. These concepts have been applied to a wide array of economic issues, such as policy choices involving natural resources and commodity rationing [Baumol, 1980, 1982, 1986]; labor arbitration devices [Crawford, 1977, 1979, 1980]; fair wage structures [Svensson, 1980]; just allocation of rights [Austinsmith, 1979]; and income distribution and taxation [Allingham, 1976; Archibald and Donaldson, 1979; and Howe and Roemer, 1981]. There is thus an increasing awareness among economists that policy decisions are at least partially motivated by equity considerations.

At this preliminary stage in the application of the concept of equity to accounting it seems appropriate to use a relatively broad definition of equity—equality of opportunity. This definition is attractive because it is widely accepted as a goal of public policy and is proclaimed as such in public debate, party platforms, political speeches, and tracts on educational and social reform. It is even argued that equality of opportunity, as opposed to equality of actual outcomes, should be the sole principle of justice guiding government decisions (e.g., Joseph and Sumption [1979]).

A major characteristic of equality of opportunity is that it is an *ex ante* concept of equity, as opposed to the more familiar *ex post* concepts of justice that call for equality of actual outcomes. The two are not independent, of course. Intuitively, increasing equality of opportunity will contribute significantly to equality of outcomes [Okun, 1975]. The main attraction of the *ex ante* equality of opportunity concept is that it conflicts less with efficiency incentives than do the egalitarian *ex post* concepts of equity. Equalizing opportunities allows for more incentives to work and invest than does equalizing actual income or wealth. Thus, the equity-efficiency conflicts that frequently concern policymakers are mitigated when equality of opportunity is chosen as the guiding concept of equity.

When application to capital markets and information disclosure is considered, the superiority of an *ex ante*-based definition of equity is clear. Any mechanism that leads to equalization of actual outcomes across investors in capital markets will not only eliminate all incentives (e.g., to search for information) but also strip the stock market of its main attraction—the provision of a wide variety of risk-return alternatives to investors. No rewards for risk-taking are possible when differences in realized outcomes are redressed, *ex post*, in an egalitarian way.

It is postulated here that in the context of capital markets, inequality of opportunity is present when investors are endowed with different information about securities or market mechanisms, a situation known as differential, or asymmetric, information. This follows the path taken by information economic models, which show that the existence of information asymmetries is the major reason for systematic, *ex ante* risk-adjusted return differentials across investors.[5] That is, equality of opportunity is obtained when all investors are equally endowed with information, since in this case risk-adjusted expected returns would be identical across investors.[6]

The proposed definition of equity as equality of opportunity or symmetric information is appealing for accounting research since it lends itself to both theoretical analysis and empirical quantification. The extent of equality of opportunity can be defined and measured by the differences in expected, risk-adjusted excess returns across investor classes. Obviously, when market prices are fully informative—a special case of equality of opportunity—this measure will be zero. Furthermore, the effects of changes in the information environment (e.g., a new disclosure rule) on equality of opportunity can be evaluated on the basis of changes in such inequality measures as the disparity of expected returns. An equity-based accounting policy can thus be rigorously defined and its social consequences assessed quantitatively in terms of decreases in information asymmetries, or changes in observable variables affected by information asymmetries, such as bid-ask spreads and volumes of trade. Sections IV and V elaborate on the measurement and applications of the above concept of equity.

It is sometimes argued that since any investor could become informed if he chose to (e.g., analyze financial statements, subscribe to analysts' reports), differential information across investors could not be regarded as inequitable. Following the classical paradigm, each investor will acquire information until his or her marginal cost equals the marginal benefit of information. However, this laissez faire/perfect competition type of argument ignores an important characteristic of information—increasing returns to scale—which might endow some investors with monopolistic rents and effectively bar others from becoming informed. This characteristic was noted by Arrow [1974, pp. 38-39]:

> The main remark that can be ventured on now is the familiar one that there are increasing returns to the *uses* of information. The same body of technological information, for example, can be used in production on any scale and therefore towards productive enterprises with some degree of monopoly power, in accordance with familiar principles.

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[5] For example, Grossman and Stiglitz [1976, p. 248, emphasis added] comment:

> Prices do not fully reflect all available information, in particular, that of the informed; the informed *do a better job* in allocating their portfolio than the uninformed.

This "better job," reflected in excess returns (above the competitive level), is thus ascribed to information asymmetries. Or:

> the effect of knowing more than others, *ceteris paribus*, in this case as well as in general, is to be able to improve upon one's welfare at the expense of those who know less. [Hakansson, 1981, p. 15]

While information asymmetries are obviously the major reason for differential expected returns, there might be additional reasons, such as transaction costs.

[6] Note that I define equality of opportunity as equal expected returns, while economic analysis is generally couched in terms of *utilities* of returns. This is a known inconsistency resulting from the need in equity analysis to compare situations across individuals; utilities, of course, cannot be cross-sectionally compared. Rawls [1971, p. 155] notes:

> The essential point though is that in justice as fairness the parties do not know their conception of the good and cannot estimate their utility in the ordinary sense. In any case, we want to go behind *de facto* preferences generated by given conditions. Therefore, expectations are based upon an index of primary goods and the parties make their choice accordingly. The entries in the example are in terms of money and not utility to indicate this aspect of the contract doctrine.

For elaboration of this issue in an economic context, see Howe and Roemer [1981].

This applies where the value of information is independent of the choice of scale, or investment, and it seems to be the case for persons investing in human capital (e.g., learning and experience in the analysis of corporate financial statements), or in the development of analytical tools and techniques that can be applied repetitively to many investments (e.g., a bankruptcy prediction model, an earnings forecast model, a systematic risk estimation technique, or a "program trading" mechanism). Following Arrow's intuition, Wilson [1975] proved that there are indeed *increasing returns to scale* in the production of information: the cost of information per unit of scale declines as the scale increases, whereas the value of information per unit scale does not change—"The net result is ever-increasing expected returns to scale" [Wilson, 1975, p. 189]. Consequently, the possibility of monopolistic behavior by large-scale information producers and users arises. Accordingly, at relatively low levels of investment, acquisition of information may not be economically justifiable, whereas larger investment operations will justify becoming informed and will be associated with excess (at the limit—unbounded) returns. Thus, well-endowed investors operating on a large scale can be expected to earn a higher return on their investments than less endowed investors, given that the former have access to certain kinds of information which are characterized by increasing returns to scale. Indeed, Feldstein and Yitzhaki [1982] recently reported that wealthy investors earn a substantially higher return on their investments than do low-income investors.

Thus, classical equity concerns, resulting from the possibility of high-income investors gaining monopoly rents, and low-income investors facing barriers-to-entry into the information market, cannot be *a priori* ruled out. However, as argued in the next section, the equity orientation presented here is of a broader scope and applies even to cases where information yields competitive returns.

II. THE SOCIAL CONSEQUENCES OF INEQUITY IN CAPITAL MARKETS

The traditional view, often espoused by policymakers and accountants, that there is a need to protect the "small" (presumably uninformed) investor was probably derived from genuine concerns about inequities in capital markets. However, the call for regulation to redress such inequities was generally phrased in vague, naive and somewhat paternalistic terms suggesting that uninformed investors were at the mercy of market insiders. This rather unconvincing plea for regulation, emphasizing *fraud* as the major hazard to investors, effectively dampened the interest of modern accounting and economic researchers in equity issues. A typical example is Ross [1979, p. 190], who dismisses equity considerations in disclosure regulation because they are based on such "defenseless investor" arguments:

> The equity benefits of [*disclosure*] legislation—as between insiders and outsiders—are more difficult to identify. The case for such benefits seems to rest on the traditional view that outsiders are at the mercy of insiders, and need to be protected from them.[7]

The equity concern that underlies the thesis of this study stems from an entirely different perspective. The core idea, in contrast to the traditional view, is that uninformed investors are far from defenseless. Indeed, they have at their disposal a wide array of measures capable of protecting them against exploitation by the informed.

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[7] See, also, Beaver [1981, ch. 7] for criticism of the traditional equity motivation of disclosure regulation.

The uninformed can defend themselves by minimizing trade with the informed, that is by buying and holding well-diversified portfolios for the long run. Alternatively, the uninformed can identify specific groups of insiders, such as managers, and prohibit them, by legal or contractual arrangements, from trading in the securities of their own firms. At the extreme, suspecting gross information asymmetries, uninformed investors may quite rationally withdraw from trading in specific securities or from the stock market altogether.[8] Note that each of these protective measures is costly to both the informed *and* uninformed investors, as well as to the economy as a whole. Thus, holding securities for the long run denies investors the benefits of portfolio rearrangements as economic circumstances change. Prohibiting managers from trading in the securities of their firms decreases the benefits from owning such stocks, which, in turn, limits the usefulness of managerial stock ownership in aligning the interests of owners and managers (reduction of agency costs). A massive withdrawal of uninformed investors from the market will strip the informed of the benefits of their costly-acquired information (thereby decreasing incentive for information production), and will deprive the economy of the allocational and risk sharing benefits of large and efficient capital markets. Herein, therefore, should lie our concern with inequity in capital markets. It stems from the adverse social effects brought about by the defensive measures taken by uninformed investors who perceive significant inequity.

The economic consequences of the protective measures taken by less informed investors when facing informed ones are demonstrated rigorously by recent models of the capital market microstructure. These models establish a direct link between information asymmetries (inequity, in our context) and such market characteristics as bid-ask spreads, transaction costs, volume of trade, and social gains from trade. Consider, for example, the recent Glosten and Milgrom [1985] model in which the behavior of the "specialist" (market maker), who matches buyers and sellers, is investigated. The specialist faces two groups of traders: the "informed investors," who know more than he or she does about the specific firm (e.g., knowledge of an impending takeover bid), and the "liquidity traders"—those who either know less than the specialist or those who must trade because of pressing liquidity needs. The basic idea is that the specialist, like any other market participant, will lose, on the average, on trades with the more informed investors, because they will not trade with the specialist unless his or her quoted prices are favorable relative to their information.[9] The specialist must, therefore, recoup these losses by gains in trade with the liquidity traders, who incur a "fee" for immediate liquidity. This loss/gain balance is achieved by setting an appropriate bid-ask spread. The bid-ask spread thus serves as a *defensive mechanism* against the specialist's expected losses to more informed investors.[10]

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[8] For example:

> Concern about asymmetric information among investors could be an important reason why some institutional and individual investors do not invest at all in certain securities, such as shares in relatively small firms with few stockholders. [Merton, 1987, p. 488]

In many stock markets around the world (e.g., in Brazil, Chile, Spain, and Israel) the participation of individual investors is very limited. A frequent explanation provided for this phenomenon is that individuals shy away because these markets are dominated by a few, highly informed investors, rendering investment by individuals an unfair game.

[9] For example, Stoll [1976] reported that NASDAQ dealers tend to acquire shares when prices fall and sell when prices rise. Also, dealers' inventories tend to increase on days prior to price declines and decrease prior to price rises. This evidence is consistent with the prediction that dealers lose, on the average, on trades with informed investors.

Glosten and Milgrom show that "ask" prices (for the sale of securities by the specialist) will increase and "bid" prices decrease when: (a) the quality of information possessed by the informed investors improves (e.g., becomes less uncertain), and/or (b) the number of informed investors increases relative to liquidity traders. Significant information asymmetries lead the specialist to set the spread so wide as to render the trade in the stock very thin until it might cease to exist altogether:

> One of the interesting features of our model is that there can be occasions on which the market shuts down. Indeed, if the insiders are too numerous or their information is too good, . . . there will be no bid and ask prices at which trading can occur and the specialist can break even. Then, the equilibrium bid price is set so low and the ask price so high as to preclude any trade. . . . A market once closed, will stay closed until the insiders go away or their information is at least partly disseminated to market participants from some other information source. [Glosten and Milgrom, 1985, p. 74]

This specter of a market becoming thinner and eventually being shut down illustrates our earlier statement that uninformed investors suspecting gross inequity will not participate in the market. Note also that Glosten and Milgrom's solution to opening a "closed market" is to publicly disseminate some of the insiders' information. This plays an important role in the following section.

Information asymmetries, or inequity in capital markets, will thus be reflected in relatively wide bid-ask spreads, and the more severe the inequity (due to the number of insiders and/or the extent of their informational advantage), the larger the spreads. The size of spread, in turn, determines the effective transaction costs involved in trading the securities. Therefore, large informational asymmetries will be associated with large transaction costs (Demsetz [1968]; Epps [1976]; Amihud and Mendelson [1980]; and Copeland and Galai [1983]).[11] Furthermore, large spreads and transaction costs will also be associated with low volumes of trade and a lower number of traders (e.g., Glosten and Milgrom [1985]; Hamilton [1978]; Stoll [1985]; and Karpoff [1986]).[12] Recently, Mendelson [1985] has shown that increasing the number of traders always increases the expected average gains from trade, that is, the aggregate gain accruing to a community of traders as a result of the market operation. Furthermore, he showed that increasing the number of traders increases the liquidity of the market and decreases the variability of prices.

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[10] Another hypothesized motive for maintaining a bid-ask spread is inventory holding costs (see, Garman [1976], and Amihud and Mendelson [1980]). The origins of the informational asymmetry motive for the spread can be traced to Bagehot [1971]. See, also, Copeland and Galai [1983], and Benston and Hagerman [1974].

[11] It is important to note that the effect of information asymmetries on fundamental market characteristics, such as transaction costs and gains from trade, is not limited to securities with large bid-ask spreads. The specialist model outlined above is merely a convenient way of demonstrating this link. Even with heavily traded securities having narrow spreads, investors suspecting serious informational disadvantages will protect themselves by either not trading at the current market price, or by giving "limit orders" that effectively restrict trade. In a limit order, the investor in fact operates as a specialist.

[12] The socially adverse effects of low volumes, reflecting decreased opportunities for risk sharing and withdrawal of investors from the market, can be shown even in cases of homogeneous information. Ohlson and Buckman [1981] show that in such cases information serves the role of markets, namely increases risk sharing by effectively enlarging (enriching) exchange opportunities.

Thus, based on the above theoretical analysis and empirical evidence, increased information asymmetry, or inequity, is associated with a lower number of investors, higher transaction costs, lower liquidity of securities, thinner volumes of trade and it leads, in general, to decreased social gains from trade. Disclosure regulation, it is argued below, is aimed at mitigating these adverse effects resulting from capital market inequity.

III. THE POLICY QUESTIONS REVISITED

Equipped with an operational concept of equity and with appreciation of the adverse private and social consequences of inequity in capital markets, I now reexamine the largely unanswered policy questions raised in the introduction and consider whether equity analysis can provide insight into:

- Why is the public disclosure of financial information mandated?
- What "public interest" standard should guide regulators?
- How can the social consequences of regulation be evaluated?[13]

Why Disclosure Regulation?

How can the adverse consequences of inequity in capital markets be alleviated? The most effective remedy would be to remove the major source of inequity—the informational advantage held by informed investors. This advantage could be decreased by instituting a policy mandating regular and timely public disclosure of information pertinent to the valuation of securities. This, then, provides a justification for disclosure regulation. Reemphasizing, such a public policy is not assumed here to be motivated by an altruistic or politically-oriented desire to assist some persons (e.g., uninformed investors) *at the expense* of others, in a zero-sum sense.[14] Rather, the proposed motivation for disclosure is based on the more economically palatable notion that by removing the source of inequity, one lessens the generally harmful effects of the defensive measures that are naturally taken by the uninformed, thereby improving *overall* welfare. This is a well-known principle in public policy:

> It is possible in our society to argue for a government program to help the poor. But, the argument is not that the poor, being part of the winning coalition, should benefit at the expense of others. The argument is that by helping the poor we can make everyone better off, that helping the poor is not merely a means to make the poor happier but a means to reduce crime, make us all feel less guilty, make the cities livable, etc. What may, from the standpoint of wealth, be a (small) redistribution is

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[13] This is not an exhaustive list of relevant policy issues. Another interesting issue, for example, is the division of regulatory responsibilities between the private and the public sectors, federal and state governments, etc. Currently, disclosure regulation is promulgated by the SEC, the FASB, and, to a lesser extent, by various state laws (e.g., the "blue sky" laws) and by the stock exchanges. Although the pros and cons of the various institutional settings are often discussed (e.g., Chatov [1977], and Easterbrook and Fischel [1984]), the issue of the socially optimal regulatory setting is still an open one. It is not clear at this stage whether equity analysis can contribute to this debate.

[14] Such a zero-sum motivation appears to underlie the well-known objective of information disclosure suggested by the Study Group on the Objectives of Financial Statements [AICPA, 1973, p. 17]:

> An objective of financial statements is to serve primarily those users who have limited authority, ability, or resources to obtain information and who rely on financial statements as their principal source of information about an enterprise's economic activities.

The absence of a substantive, theoretically-founded motivation for this objective in the Study Group's report may have contributed to its abandonment by the FASB.

> defended as, from the standpoint of utility, a Pareto improvement. [Friedman, 1980, p. 231]

The complete equity-efficiency consequences of disclosure regulation have yet to be analyzed in detail. Under some circumstances, the transfer of information from the informed to the uninformed via a public disclosure rule will be Pareto preferable, namely will result in some investors being better off while none are worse off, due to the generally increased opportunities for trade and risk-sharing (e.g., through the increased investor base and/or higher liquidity brought about by decreased information asymmetries). Under different circumstances, such a disclosure policy might lead to weaker requirements of improved efficiency, in the sense that a suitable (hypothetical) redistribution of *endowments* will make everyone better off. It is, of course, also possible that some disclosure rules might result in "pure welfare redistribution," namely, in some investors benefitting at the expense of others. It should be emphasized, however, that even if such redistribution cases exist, the possibility of capital markets breaking down due to severe information asymmetries (recall Glosten and Milgrom's scenario, above) justifies disclosure regulation. Such regulation, it is argued here, is intended to shore up markets, and the possibility of a market breakdown is generally more harmful than some wealth redistribution.[15]

More efficient, nonregulatory (decentralized) means of achieving the desired decrease in informational asymmetries are not self-evident. Hypothetically, one can envisage the informed investors, who stand to lose as a group from the existence of significant information asymmetries, colluding to lessen these asymmetries. This could be done, for example, by a voluntary release of financial information by professional organizations such as the Financial Analysts Federation (a case of industry self-regulation).[16] However, such a collusive action by a large number of participants is highly impracticable. Incentives to break away from an arrangement of this sort abound, since the *private* gains to some informed investors from exploitation of information will probably outweigh their loss from informational asymmetries.[17] As for the oft-mentioned argument that firms, motivated by self-interest, will voluntarily release financial information (the "disclosure principle" in, e.g., Ross

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[15] Note that the current discussion is mainly concerned with disclosure policy. There are, of course, additional accounting issues of importance, such as the choice of specific measurement techniques from a given set of alternatives. Such "measurement" issues clearly have considerable impact on various uses of accounting numbers, such as for contracting purposes (e.g., in management compensation systems or loan covenants). However, to the extent that these measurement issues do not affect the extent of information asymmetry in capital markets, they appear to be unrelated to an equity-oriented accounting policy, and hence will not be pursued here.

[16] An interesting example of a voluntary release of information is found in racetrack betting. The programs of many racetracks (listing the horses, trainers, jockeys, etc.) include a prediction of the order of finish provided by the track's official handicapper. This prediction, sometimes known as the "selection," is based on a plethora of information about the past performance of the horses, jockey, and trainer standings, etc. The voluntary provision of such summary information is probably aimed at increasing the participation in betting by uninformed persons, by decreasing the informational advantage of the experts.

[17] An analogy with agency theory suggests itself here. This theory postulates that it is often in the interest of agents (managers) to alleviate the concern of principals (owners) regarding the excessive appropriation of perquisites, by such means as a voluntary provision of information, bonding devices, or independent audits. Here, we argue, it is sometimes in the interest of informed investors to increase equity in capital markets in order to attract uninformed investors. The analogy stops here, however; whereas top management is a small, cohesive group that can easily collude in order to decrease agency costs, informed investors cannot effectively collude to decrease information asymmetries.

[1979]), it seems highly likely that such private incentives may leave disclosure at a suboptimal level. Theory suggests that impediments to such voluntary release of information abound; for example, unless investors know that managers have the required information, there will be no incentives for the latter to release it (e.g., Dye [1985], Easterbrook and Fischel [1984]). Furthermore, empirical evidence also appears to be inconsistent with such voluntary release of information (Lev and Penman [1987]). Therefore, it seems fair to conclude that decentralized, self-regulatory alternatives to disclosure regulation, aimed at enhancing equity in capital markets, are not readily available.

The equity-oriented justification for disclosure regulation does not, of course, preclude the existence of other regulatory motives. However, the equity motive seems to be more compelling than others, mainly because it is not country- or period-specific as most other explanations are, and therefore applies well to a world-wide, persistent phenomenon such as disclosure regulation. Consider, for example, the argument that regulators are not really concerned with economic efficiency or with equity, rather their primary goals are: (a) to serve the needs of organized interest groups (e.g., security analysts, or public accountants), (b) to expand the scope of their own operations and power base, or (c) to avoid public scandals. These "political process" arguments view bureaucrats as seeking to transfer wealth among competing interest groups, where they themselves constitute one such group (for elaboration, see Watts and Zimmerman [1986, ch. 10]). While there is some general validity in these arguments, they do not provide, in my opinion, a convincing explanation for the prolonged existence and continuous expansion of disclosure regulation in virtually all free market economies.

Consider, for example, the "interest-groups" (or the "capture theory") argument which suggests that regulation is intended to benefit specific groups of market participants. Such groups vary considerably across countries in their power and structure (e.g., in many countries such as Israel, financial analysts and brokers are few and poorly organized, and public accountants do not enjoy strong political influence), yet extensive and quite uniform disclosure regulation is almost universal. Furthermore, the preliminary empirical evidence that exists on this issue in a non-accounting context does not support the "interest-groups" argument (e.g., Schwert [1977], and Kalt and Zupan [1984]).[18] As to the "power-base increasing" argument, how can one explain the fact that since 1934 the SEC has largely relinquished its all-important and powerful authority to set accounting standards to private-sector organizations, such as the APB and the FASB? What is more "power-base increasing" in the capital market context than the power to set accounting standards?[19] Also, changes in the political environment cannot be ignored. Both the current and previous admininistrations have significantly curtailed the scope of several regulatory agencies, such as the Civil Aeronautics Board and the Federal Trade Commission, despite the strongly vested interests and the "power base" motives involved.[20] Even the securities laws were curtailed, such as the 1975 deregulation of exchange services (brokers' price-fixing). Disclosure regulation, on the other hand, appears to withstand political changes. Thus, despite the possible validity of the politically-motivated arguments in other contexts, they do not appear to provide a satisfactory explanation for the pervasiveness of disclosure regulation across time, different cultures, economic regimes, and capital market structures.

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[18] Easterbrook and Fischel [1984, p. 672] note:

> The interest group explanation that might account for securities legislation also could explain airline and trucking regulation. Yet these systems have been almost obliterated. Perhaps securities laws have survived because they are not predominantly interest-group legislation. . . . We are less confident, however, that interest-group support is the sole explanation for securities regulation. We think it appropriate, therefore, to search for the "public interest" justification of those laws.

[19] This statement is not generally accepted. William Kinney, for example, commented in private communication:

> The SEC may have "relinquished" its accounting rule making authority because it did not believe it was important, thought it was too costly or thought that it would expose the Commission to complaints *ex ante* and risk of being held responsible for disclosure-based scandals *ex post*.

Similar reservations apply to the "historical accident" explanation for regulation, namely that the securities acts arose as a response to the Depression-era financial crisis. While the timing of the securities acts in the U.S. was undoubtedly affected by the financial crisis of the 1930s, it is hard to attribute the unique persistence and continued expansion of this regulation to an event that occurred over 50 years ago, particularly as so many other Depression-related regulations fell by the wayside:

> The Securities Act of 1933 and the Securities Exchange Act of 1934 have escaped the fate of many other early New Deal programs. Some of their companions, such as the National Industrial Recovery Act, were declared unconstitutional; others, such as the Robinson-Patman Act, have fallen into desuetude; still others, such as Social Security, have been so changed that they would be unrecognizable to their creators. Many of the New Deal programs of regulation lost their political support and were replaced by deregulation; communications and transportation are prime examples. The securities laws, however, have retained not only their support but also their structure. [Easterbrook and Fischel, 1984, p. 669]

Moreover, the universality of similar disclosure regulations across practically all free market economies—a phenomenon of major importance which is emphasized throughout this study—is inconsistent with the "historical accident" argument. Historical accidents are usually country- and period-specific, making it difficult to argue that they explain persistent, world-wide phenomena. On the other hand, the above-proposed equity justification for disclosure regulation appears consistent with such phenomena.

IV. AN OPERATIONAL PUBLIC-INTEREST CRITERION

Given that the enhancement of equity in financial markets is (or should be) a major public-interest objective of accounting policymakers, how can such an objective be operationalized? What equity criteria or guidelines should direct regulators in their choice of accounting disclosure rules? First, consider briefly the criteria that guide policymakers, particularly the FASB, at present. The basic premise underlying the FASB's activities is that:

> the principal role of financial reporting [is] to furnish the investor and lender with information useful to assess the

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[20] Note, for example, a recent statement in the *Wall Street Journal* (February 24, 1986, p. 6): "The Reagan Administration sent the U.S. Congress the biggest liberalization ever of the country's antitrust laws last week, widely thought of as America's guarantee against monopolization and predation in the marketplace. The package will make it harder for the Justice Department to ban mergers. . . . Douglas Ginzberg, the administration's assistant attorney general for antitrust, said that in the coming congressional scrutiny of the package, 'I think that what will emerge, and perhaps surprise some, will be the nonemotional character of the debate.'"

> prospective risks and returns associated with an investment. [FASB, 1976b, pp. 3–4]

However, given our limited knowledge of the specific information modes that are useful in assessing prospective risks and returns (e.g., are accrual earnings superior to cash flows?), it is not surprising that a general objective such as the aforementioned can hardly guide accounting policymakers in specific information choices.[21] The attempt to fall back on *qualities* of useful financial information, such as relevance, measurability and reliability, has also not been very successful. Not only are there fundamental conflicts among various desired qualities (e.g., the more relevant the information, say earnings forecasts, the lower in general its verifiability), but sole reliance on such qualities ignores a basic characteristic of information: the value (relevance) of an information item cannot be determined outside a specific decision context. There is no such thing as universally superior, or relevant information.

We thus reach the well-known impasse: given our limited knowledge of valuation-relevant information and the existence of diverse users of financial information (having diverse endowments, preferences, and information), it is not clear what criteria should guide policymakers in their disclosure choices, except for the rare situations in which *everybody* can be made better off (no conflict situation). The following statement by the FASB [1976b, p. 157; see, also, Arthur Andersen, 1960] appears to recognize this problem:

> Financial statements are used by various parties with often opposed interests, and information in those statements should not favor one interest to the detriment of another.

However, such "evenhandedness," or fairness of information is obviously impossible to achieve in most situations.[22] This led the FASB to recognize the need for a social desirability criterion:

> Since the arguments on both sides [*for and against a proposed accounting change*] are often biased by self-interest or preconceptions about the public interest, it is necessary to air those differences of opinion and the arguments for and against them. But no objective solution is possible in the absence of a standard that specifies the public interest or the most desirable effect on the economy or society. [FASB, 1976b, p. 163]

But, what is this elusive standard that "specifies the public interest"?

The equity objective seems to provide such a standard:

> *The interests of the less informed investors should, in general, be favored over those of the more informed investors.*

Such a public policy, consistently applied, will contribute to equality of opportunity in financial markets through the decrease of information asymmetries and the increase in the degree of informativeness of prices, thereby alleviating the socially harmful effects of inequity discussed in Section II. Can this equity criterion of continuously decreasing information asymmetries be operationalized to provide plausible standards for accounting policymakers? Is it more operational than the current goal of searching for information that will be

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[21] The situation is even more complicated, since even if the specific information modes needed for "assessing prospective risks and returns" were known, the welfare implications of a mandated public disclosure of this information would be very difficult to ascertain in a Pareto-efficiency context.

[22] See Ball [1987] for a different interpretation of fairness in a contracting context.

"useful in making investment decisions"? I believe it is, since identifying specific information items that are, at a given point in time, at the disposal of some investors while not of others seems a more manageable task than establishing whether and what information is in some sense useful (the current goal). The former is a matter of fact while the latter is, for the time being at least, a matter of judgment or, worse yet, speculation.

Consider a specific example—the public disclosure in financial statements of management's forecasts of earnings. The issue is obviously complex: the predictive quality of such forecasts, the legal liability of managers and auditors, the associated "moral hazard" of managers, and the possible compromise of company secrets, are examples of the potential problems associated with mandating the disclosure of earnings forecasts. Accordingly, determining the social usefulness of such information from an allocative efficiency point of view seems, at present, an insurmountable task. However, from an equity perspective, this choice is more tractable. Two facts, potentially leading to inequality of opportunity in financial markets, seem indisputable: (a) information on management's perceptions of future earnings is asymmetrically distributed (probably known to the firm's bankers and major investors, in addition to corporate insiders), and (b) the use of such forecasts in investment decisions leads to excess returns. Evidence from voluntary releases suggests that many of these earnings forecasts are of high quality, relative to extrapolative forecasts (e.g., Brown and Rozeff [1978]), and that timely access to them yields abnormal rates of return (e.g., Patell [1976] and Penman [1980]). Therefore, from an equity perspective of decreasing information asymmetries, these facts seem sufficient to justify mandating the disclosure of earnings forecasts in financial statements, or preferably in more timely public releases.

How can an equity-oriented accounting policy aimed at identifying information items which are not in the public domain and could lead to excess returns, be operationally pursued? One approach is to investigate the operations of analysts or institutional investors who presumably are privy to inside information. For example, Leftwich [1983], in a different context, identified the typical information items used in lending decisions. Some of these items are not publicly disclosed, and tests can be conducted to determine whether the use of such information in, say, stock valuation models, leads to excess returns. Collins [1975] used a similar method in the context of lines-of-business reporting, showing that investors with private access to lines-of-business information prior to 1970 (when the release of such information became mandatory) could have gained excess returns. A similar, market-based methodology can identify items which are not currently disclosed in financial statements and that can possibly lead to excess returns. The set of candidates for such disclosures should extend beyond conventional financial data. For example, unfilled orders of manufacturers of durable goods—a leading indicator of future performance, or data on seat occupancy (load factor) of airlines, are potentially value-relevant information items which are known to some individuals outside the firm. It would, therefore, be instructive to examine empirically whether the use of such information is associated with excess returns.

The search for asymmetrically distributed information items, possibly leading to excess returns, can be aided by stock valuation and other economic models. For example, Bulow and Shoven [1978] developed a model in which the timing of corporate bankruptcy and the extent of creditors' losses depend, among other things, on the liquidation value of the firm's assets. Data on liquidation values might therefore be of importance to some investors, particularly unsecured creditors. Another example, is the extension of the Capital Asset Pricing Model to multi-product firms (Rubinstein [1973] and Collins and Simonds [1979]) where the firm's risk is shown to depend on the proportions of the total resources committed to the production of each product-line. This suggests the desirability of disclosing assets by product-lines, in addition to the currently required disclosure of sales and profits. Thus, the search for asymmetrically distributed information possibly leading to excess returns is an obvious area in which both theoretical and empirical research can be of direct usefulness to equity-oriented policymakers.

Finally, the policy of decreasing information asymmetries advocated here treats the informed investors as one group; in particular, it appears to make no distinction between a *costly* acquisition of information by the informed (say, financial analysts) and other means of getting informed. However, it is sometimes argued that there is no inequity involved in gains derived from the use of costly acquired information. On the contrary, goes the argument, such an endeavor should be encouraged since it increases market efficiency. On a closer examination, however, the distinction between costly and "non-costly" acquired information seems nonexistent; *any* acquisition of information is costly, in a direct or indirect way. Suppose, for example, that managers have a monopolistic access to information about their firms and that such information could be used by them to yield excess returns. Clearly, even such inside information will not be costless to managers, since competition in managerial labor markets will cause the expected rents from using the information to be reflected in lower managerial compensation. It is not clear, therefore, that there is a meaningful distinction between costly (presumably equitable) and costless acquisition of information. (There is, clearly, an important distinction between information benefits—competitive or monopolistic rents, discussed in Section I.)

Moreover, it is important to note that the adverse effects of information asymmetries, discussed in Section II, apply equally to cases where the "informed" acquired their information through research and analysis as well as to other means of information acquisition. Irrespective of the sources and costs of information, significant information asymmetries will result in socially adverse effects. Accordingly, it would be socially beneficial to reduce *to a certain extent* significant information asymmetries, even if they were obtained "legitimately," by research and analysis. Such a reduction of information asymmetries, through a mandated disclosure policy, will in general benefit even the active information searchers, as it will increase the number of investors in the market, improve liquidity and reduce transaction costs. Therefore, and contrary to widespread beliefs, incentives for information search will not necessarily be reduced by disclosure regulation.[23] In any case, the challenge to

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[23] This important point, which also plays a role in the current debate about the SEC's enforcement of insider-trading rules, appears to be lost on the debaters. Witness, for example, the following argument:

> On the one hand of the spectrum [*of the definition*

accounting researchers and policymakers is to design such information disclosure policies that will minimize the equity-efficiency conflicts.

V. EVALUATION OF REGULATION CONSEQUENCES

The evaluation of social consequences is an integral part of any public policy; it provides the basic input for the continuing process of assessment and restructuring of such policies. In recent years, the evaluation of accounting policy has focused on examining the impact of regulatory changes on the characteristics of stock prices.

Although such impact is of considerable interest, it does not directly address the issue of policy desirability, unless one makes strong assumptions (see Lev and Ohlson [1982]). Even a regulation change that leads to a rise in the stock prices of the affected firms cannot be unambiguously labelled socially desirable. Moreover, the preoccupation of current research with *average* beliefs and stock price reactions to informational events precludes the consideration of important equity issues, such as who gains and who loses from the informational change, and by how much. Additional lines of research should, therefore, be pursued in order to assess the social consequences of accounting policy. Several suggestions follow.

Bid-Ask Spreads and Volume Effects

The theory discussed in Section II suggests that the extent of information asymmetries will be reflected in the size of bid-ask spreads and in the level of volume of trade. Indeed, empirical evidence (e.g., Benston and Hagerman [1974], Morse and Ushman [1983], and Venkatesh and Chiang [1986]) supports the relation between information asymmetries and bid-ask spreads. Accordingly, the effectiveness of disclosure regulations, aimed at increasing capital market equity (i.e., lessening information asymmetries), can be determined by examining whether changes in average bid-ask spreads and trade volumes of the affected securities occurred subsequent to the regulation enactment. Or, by searching for the existence of cross-sectional differences in these variables between securities impacted by specific regulations (e.g., oil and gas) and those not affected by the regulation. The social-desirability implications of trade-volume studies [Lev and Ohlson, 1982, sec. 3.1] are still not fully appreciated by accounting researchers. Welfare analysis essentially deals with *actions* of individuals rather than with changes in beliefs. The former are most clearly picked up by trading volume while the latter are indicated by price changes, which is generally the variable examined by accounting researchers. Note that the use of a trade-volume variable (e.g., Beaver [1968], Morse [1981], and Bamber [1986]) was aimed at inferring

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> *of insider trading*] are the advocates of the equity-based definition of inside activity, sometimes known as the "equal-information" theory. In this view anyone making a trade based on superior information is in effect "stealing" from other market participants by acting before all other stockholders. . . . Economists have questioned—indeed fought against—the equal information theory from its inception. They have argued that superior information, legally obtained, is fundamental to trading activity and efficiency in the stock market. [Jarrell and Pound, 1987, p. 38]

Here again, the equity ("equal information") approach is phrased in moralistic terms—"stealing from other market participants"—and is pitted against the economic/market efficiency approach. The important point missed here and so often elsewhere is that the "two approaches" are essentially one and the same: As argued in this study, it is not the "stealing" of information that is of major social concern, but that significant inequality (asymmetry) of information will lead to adverse economic consequences which will ultimately result in reduced market efficiency.

the information content of specific releases, such as earnings, from volume changes *at* disclosure date. On the other hand, the research approach suggested here is aimed at examining longer-term changes in average volumes, before and after significant regulation changes. As to the use of bid-ask spreads, the effects of regulatory changes on such spreads to infer equity changes have not been investigated so far, although it seems rather straightforward to extend current market-based research in this direction.

Changes in Price Informativeness

Ceteris paribus, the more informative security prices, the less, on the average, the potential gain in excess returns to informed investors. Thus, an increase in the degree of price informativeness (due, say, to mandated information disclosure) will enhance equity by decreasing, on the average, the expected returns to inside information. Empirical tests examining whether changes in price informativeness are associated with specific regulations can therefore be regarded as tests of the equity consequences of accounting policy. The degree of informativeness of prices can be inferred from the extent of price variability around the disclosure date of an information item, such as quarterly earnings. Ohlson [1979] showed that the more informative prices are, the lower their variance (response) will be at the time of the information disclosure. This was empirically supported, for example, by McNichols and Manegold [1983] who found that the variability of prices upon the release of annual earnings that were not preceded by quarterly disclosures were higher than those where annual earnings disclosures were preceded by quarterly earnings disclosures. Prices in the former cases were evidently less informative than in the latter. Similarly, Atiase [1985] and Grant [1980] reported that price variability on the earnings release date of small OTC firms was higher than for large NYSE firms. This differential reaction of prices to earnings disclosure can be attributed to the smaller amount of information available (or demanded) about small firms than about larger ones (or, to some extent, to differential stock exchange regulations).

The aforementioned method can be applied, for example, to determine the equity consequences of the 1933–34 securities regulations, by comparing the extent of price reaction (variability) to specific information disclosure prior and subsequent to 1933–34.[24] Of course, care should be taken to control for "other variables," such as changes over time in the average variability of prices, in the degree of unexpectedness of the information disclosed, or in the amount of voluntary information available to investors (see Barry and Brown [1984] for proxies for such information). If the post-1933–34 price variability *at disclosure date* is found to be smaller than the pre-1933–34 variability, it could be concluded that the post-1933–34 prices became, on the average, more informative, probably due to the securities regulations. Such a result would be consistent with the equity objective of these statutes. Similar "before and after" studies pertaining to other major accounting regulations could be conducted.

Inside Information—Monopoly Rents

Regulation consequences can also be evaluated by examining directly whether specific regulations have decreased information asymmetries. Some methods within the context of "market-based accounting research" address this issue. Consider, for example, the SEC's lines-of-business disclosure requirement. Beginning with fiscal year 1970, multi-product firms were required to disclose revenues and profits by product lines for 1970 and for each of the preceding four years. Thus, before 1970, product-line data were available to a restricted number of persons only (e.g., managers, the firm's major bankers, and perhaps a few closely connected financial analysts). From an equity perspective, the question is whether the use of such data prior to its public disclosure could have yielded excess returns. Collins [1975] addressed this question: the 1967–1970 product-line data (first disclosed publicly in 1970), used as an input to a specific trading rule for investing in securities, yielded statistically significant excess returns for the years 1968 and 1969. Thus, investors with private access to product-line information prior to 1970 could have gained abnormal returns, relative to uninformed investors. From an equity perspective, therefore, the SEC's product-line disclosure requirements seem desirable in decreasing information asymmetries. A similar method can be applied to evaluate the social consequences of other accounting regulations, such as lease and inflation-adjusted disclosures.

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[24] Note that the suggested method is different from the one used by Benston [1973]. We are concerned here with variability at a specific date—disclosure time—and not with long-term variability, pre- and post-1933–34 (Benston's test).

Differential Expected Returns

Recall from Section I that the most fundamental equity issue in financial disclosure regulation is the extent of disparity in expected, risk-adjusted returns across investors, namely the extent of equality of opportunity. Obviously, if improvement in the equality of expected returns can be ascribed to a certain disclosure policy, its social desirability, from an equity point of view, would be established. This suggests an examination of the disparity of expected returns across classes of investors, and of changes in such disparities over time as a result of disclosure regulation. It is, of course, impossible to observe expected returns directly, but as is customary in finance and economic research, inferences about expected returns can be drawn from observed, systematic differences in realized returns.

A recent example of this line of research was provided by Feldstein and Yitzhaki [1982] who reported that stocks owned by high-income investors appreciated substantially faster than stocks owned by lower-income investors. An examination of a large sample of individual 1973 Federal income tax returns suggested a substantial return differential—a 3.0 percent average annual return in the lowest income group vs. a 10.0 percent return in the highest income group. Similar evidence was reported in an earlier study by the Internal Revenue Service for the year 1962 (IRS [1966]). To some extent such differential returns might be due to higher risk-taking by wealthy investors, and/or to more complete ("honest") reporting of capital gains by high-income investors (perhaps motivated by a tax audit threat). Nevertheless, Feldstein and Yitzhaki argue that the observed return differentials are large enough to suggest that wealthy investors enjoy systematic excess returns even within the current regulatory environment.

A related, more direct research approach regarding the consequences of disclosure policy would be the comparison of return differentials before and after major disclosure changes. For example, did return differentials across classes of investors decrease subsequent to the extensive disclosure mandated by the Securities Act of 1934? Or, was the change in the information environment following the intensive regulation implemented by the FASB during the last decade associated with a significant return differential decrease? A natural extension of this line of research would be a comparison of the extent of investor return differentials across countries having different disclosure regulations. Of course, systematic cross-country differences in economic conditions, in addition to the extent of financial disclosure, would have to be taken into account.

It should be noted that these lines of research differ markedly from current "market-based accounting research," which generally focuses on the *average* belief revisions through observations of price or volume reaction to the release of information. Direct equity analysis requires the classification of investors into several income or wealth categories or other categories, such as institutional vs. individual investors and the consideration of the impact of regulation on each category. This is similar to the analysis of other public policies (e.g., taxation, health, and education programs) which cannot be adequately evaluated by observing the impact of policies on the average person (or the average impact).

VI. SUMMARY

Inequity in capital markets, in the form of systematic and significant information asymmetries, leads to adverse private and social consequences: high transaction costs, thin markets, lower liquidity of securities, and in general—lower gains from trade. In the absence of efficient, decentralized solutions to these problems, a public policy of information disclosure aimed at mitigating the adverse effects of inequity seems warranted. This is not a policy aimed at favoring or defending a specific group of investors at the expense of others (a zero-sum situation). Rather, it is aimed at benefitting all, though not necessarily to the same extent. This is the equity-orientation of accounting public policy developed in this study.

The relevance of this equity orientation lies in its potential to improve the effectiveness of accounting regulatory bodies (e.g., the SEC and the FASB) and to enrich the accounting policy research agenda. In particular, the equity orientation provides a justification for the regulation of information disclosure; it offers policymakers an operational "public interest" criterion for disclosure choices—the systematic decrease of information asymmetries; and it opens up to researchers a rich agenda for suggesting ways to implement this public interest criterion and for an *ex post* evaluation of regulation consequences.

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SEC Disclosure Regulation and Management Perquisites

Kathleen T. McGahran

ABSTRACT: This study examines the joint effect of perquisite disclosure regulations and enforcement policies on changes in cash salary and bonus compensation paid to chief executive officers. It is hypothesized that the combined effect of an SEC perquisite disclosure requirement and the IRS policy of taxing perquisites as income causes a shift from perquisites to monetary compensation. A regression model is used to assess the changes in real compensation. The findings support the hypothesis that a change in the chief executive officers' compensation occurred as a result of the disclosure requirement and tax policies.

THIS study examines the joint effect of perquisite disclosure regulations and enforcement policies on changes in cash salary and bonus compensation paid to Chief Executive Officers (CEOs). Since 1978, the Securities and Exchange Commission (SEC) has required companies to disclose the dollar value of perquisites consumed by their executive officers, and by directors and officers as a group. The perquisites involved are benefits received by executives for their personal use which can be quantified in money and which are not available to non-executive employees. Common examples of executive perquisites include personal use of the company plane, country club memberships, and in-town apartments. In the same year (1978), the Internal Revenue Service (IRS) moved to enforce taxation of these perquisites as income.

The Internal Revenue Code of 1954 specifies that the value of benefits received by executives from their employers must be reported as income to the extent that these benefits are for the executive's personal use. However, it is assumed here that the average individual manager, prior to the SEC's 1978 disclosure requirement, did not report perquisites as income because, in the absence of disclosure, the IRS was unable to enforce its regulations.[1] Consequently, before 1978, firms considered management perquisites to be a noncompensation business expense. After 1978, IRS enforcement became more practical, resulting in a lower after-tax value of perquisites to the manager, and reducing the attractiveness of these benefits relative to

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[1] See Gibbs and McClure [1979] and Wiesen and Eng [1979] for further elaboration and documentation pertaining to the ability of the IRS to enforce perquisites as taxable income.

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Kathleen T. McGahran is Associate Professor at the Graduate School of Business, Columbia University.

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cash compensation.[2] As a consequence, we would expect managers to substitute cash compensation for perquisites.

The impact of changes in tax regulation has been an important issue for researchers working in the area of compensation. Miller and Scholes [1982], Hite and Long [1982], and Scholes and Wolfson [1984] examine the impact of tax regulation on compensation. However, regulation may be powerless in the absence of enforcement, and enforcement, in turn, is difficult when violations are unobservable. This study departs from prior studies by explicitly considering the impact of both SEC disclosure rules and IRS enforcement measures on the CEOs[3] real cash compensation (salary plus bonuses and director's fees—adjusted for inflation). Perquisite disclosure and taxation is one of the few topic areas where the interacting effect of the two policy making organizations can be studied. The disclosures in question are contained in proxy statements, and it is hoped that this study will add to the knowledge already gained from studies on annual and interim report disclosures or 10K/10Q disclosures. Thus, the issues examined are relevant to both the disclosure-regulation and management-compensation areas of accounting research.

This study formulates a prediction model for changes in compensation. Prediction errors are used to evaluate shifts in compensation over the years 1977, 1978, 1979, and 1980 for a sample of 134 firms. Results support the hypothesis that a change in real cash compensation took place in the year 1978. In addition, the magnitude of the unexpected cash compensation is correlated with the reported perquisites to further document the relation between changes in compensation and the taxation and disclosure of perquisites. The remainder of this paper is organized in four sections. The first section describes regulations affecting management perquisites. The second section describes the variables, the rationale for their use and potential control problems. The third section describes the model and results, and the last section summarizes findings.

EXPECTED EFFECTS ON COMPENSATION

Increased taxation of perquisites is expected to have two possible effects. First, the CEO is made worse off because taxes must be paid on the perquisites received and reported. As a result, the executive is expected to require additional cash compensation to maintain the same after-tax compensation as before. A "wealth" effect exists when the post-regulation after-tax wage is less than the pre-regulation after-tax wage. To examine this "wealth" effect, suppose the executive receives before-tax cash compensation of M_b and a dollar value of pre-regulation perquisites of P^*. The CEOs utility before the taxation of perquisites would be $U((1-t)M_b,P^*)$, where t is the CEOs tax rate. In order to keep the CEOs utility unchanged after the perquisites are taxed, the CEOs before-tax compensation after the change, M_a, and dollar value of post-regulation perquisites, P, would have to satisfy:

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[2] We would not expect all compensation to be paid in the form of perquisites even if they are tax beneficial. A dollar paid to the executive in the form of cash compensation is unconstrained while a dollar paid in perquisites is generally constrained by the "business" nature of the consumption. One would expect a saturation point to be reached on the types of perquisites taken (e.g., limousine rides to the office or in-town apartments). In addition, we would not expect all executives to choose perquisites over monetary compensation since different tastes exist for CEOs (e.g., a "conservative image" may be desirable for a bank's CEO but not for an advertising firm's CEO).

[3] Studies by Mruk and Giardina [1972, 1976, 1979] indicate that compensation for the five top officers and directors as a group move together. The CEO was chosen as a representative member of this group.

$$U((1-t)M_a - tP, P) = U((1-t)M_b, P^*).$$

If $P^* = P$ (no substitution), then $(1-t)M_a - tP = (1-t)M_b$, which implies that

$$M_a - M_b = tP/(1-t). \qquad (1)$$

Assuming a 50 percent tax rate, this suggests that the increase in compensation would equal the level of perquisites consumed when the perquisite level remains unchanged after the regulatory changes.

If the purpose of the increased compensation is to offset the wealth loss from perquisite taxation, the form of payment is likely to be cash salary or bonus. Deferred compensation would not be a likely means of providing managers cash to pay taxes. Granting of additional options would also be an unlikely form of compensation, since executives are typically restrained from exercising options for a prespecified holding period and these options cannot be sold in the marketplace.[4] Thus, the most logical aspect of compensation to be increased to help pay the increased tax bill is salary and bonus. To evaluate this wealth effect, we test for increases in real cash (salary plus bonus) compensation.

A second anticipated effect of taxation of perquisites is a "substitution" effect. Due to increased taxation of perquisites relative to other forms of compensation, the executive is expected to be paid less in perquisites and more or no less in all other forms of compensation. If a substitution is made into other forms of compensation such as options or deferred compensation, then we would not expect cash compensation to increase by the full amount of the decrease in perquisites.

In order to evaluate this "substitution" effect, we would ideally like to examine changes in all forms of compensation. However, it is difficult to value options and deferred compensation.[5] Therefore, we evaluate changes in cash compensation defined as cash salary, bonus, and director's fees.[6]

The use of cash compensation instead of the components of total compensation prohibits assessment of the substitution of perquisites for non-cash forms of compensation (e.g., deferred compensation and stock options). Only the substitution into cash compensation may be assessed. Examining only cash compensation biases the results against finding a substitution effect.

A further complication in analyzing the "substitution" effects on compensation is the unknown value (utility) of perquisites to the CEO as compared to the value (utility) the CEO assigns to cash compensation. If cash compensation is valued higher than perquisite compensation, less cash will compensate for the reduced perquisites. Alternatively, if perquisite compensation is valued higher than cash compensation, it will take more cash to compensate for perquisites. Consequently, although we expect cash compensation to increase due to the substitution effect, we cannot expect the increase to be a dollar for dollar substitution. An analysis of the "wealth" and

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[4] Discussions with lending officers indicate that the CEO cannot borrow against these options due to the uncertainty of their value both currently and in future periods and due to the restricted transferability of these options.

[5] Antle and Smith [1985] and Scholes and Wolfson [1984] address the measurement problems associated with deferred compensation and stock options.

[6] Lewellen and Huntsman [1970] and Murphy [1985] provide evidence showing a strong relation between salary plus bonus and total compensation. Conversely, Antle and Smith [1985] find a low correlation between their measure of current income equivalent and salary plus bonus.

In the sample of firms included in this study, the average correlation coefficient between salary plus bonus and total (unadjusted) compensation as provided in the companies' compensation tables is .794 and .737 for the deflated series.

"substitution" effects is provided later in the paper.

The above discussion assumes that the CEO does not bear the total cost of the taxation increase. This presumes that the compensation committee of the board of directors (or equivalent) is willing to provide an increase in compensation to the CEO which either fully or partially offsets the increased taxation of perquisites. The increase may be granted because 1) the CEO's compensation package must meet alternative employment opportunities,[7] and/or 2) the CEO has power and influence over the board.

In addition to testing whether there is an increase in CEO bonus and salary awards due to IRS and SEC regulations on perquisites, we evaluate whether there is a relation between the amount of perquisites provided to the CEOs and the unexpected increase in their cash compensation. We would predict that the CEOs with the largest amount of declared perquisites would have the largest unexpected increase in cash compensation. Assuming that CEOs have the same marginal tax rate, the adjustment to salary and bonus awards—to offset the additional tax burden on perquisites—should be related to the size of the disclosed perquisites.

TIMING OF EFFECTS AND REGULATIONS

The effects of the SEC perquisite disclosure regulation and IRS enforcement policies are expected to be observed in 1978. This section discusses the anticipated timing of the effects, the relevant SEC and IRS regulations, and the relevant regulations' release dates. A chronological summary of the SEC and IRS regulations is provided in Figure 1.

SEC Regulations

The SEC requires disclosure of cash compensation and total compensation for the top five executive officers individually, and for all officers and directors as a group. Cash compensation is defined as salary, cash bonuses, and director's fees. Before 1978, total compensation included cash compensation plus deferred compensation. In 1978, the definition of total compensation was expanded to include cash compensation plus options, rights, personal benefits, and contingent remuneration.[8] Prior to 1978 some information on options, rights, and contingent remuneration was disclosed, but was not included in the computation of total compensation.

SEC releases on personal benefits, referred to as perquisites, began with SEC Release No. 5856 issued on August 18, 1977. This interpretative release set forth the Commission's view that perquisites should be included in aggregate direct remuneration paid to directors and officers. The release was not specific as to what benefits should or should not be included. In response to numerous questions regarding the release, Interpretative Release No. 5904 was issued on February 6, 1978. The SEC staff noted in the interpretative release that the classification of specific expenditures as remuneration depends on whether the expenditures merely assist an executive in effectively performing the job (not remuneration) or are for purposes unrelated to the business of the company (remuneration). On July 28, 1978, Securities Act Release No. 5950 proposed sweeping revisions of the rules governing

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[7] All CEOs receiving perquisites would be affected by the taxation of perquisites. Thus, we would expect the labor market after-tax payments to these CEOs to change. Alternative compensation schemes paid to the CEOs not receiving perquisites may now be desirable.

[8] Contingent remuneration includes the increase (decrease) in the value of stock appreciation rights remaining unexercised at the end of the year as well as accruals made under pension plans, deferred compensation agreements or performance-related long-term incentive plans.

FIGURE 1

SUMMARY OF SEC AND IRS REGULATIONS RELATING TO MANAGEMENT PERQUISITES*

Date	*Agency*	*Explanation*
1954	IRS	Code which includes fringe benefits as taxable income.
December, 1975	IRS	Discussion draft of proposed regulations specifically governing the status of fringe benefits.
August 18, 1977	SEC	Interpretive Release #5856. First pronouncement stating personal benefits *should* be included in remuneration disclosures.
1977	IRS	Corporate tax return form requires a line item for deductions for travel and entertainment—not enforced.
February 6, 1978	SEC	Interpretive Release #5904. Questions and answers covering the disclosure of specific management perquisites.
July 28, 1978	SEC	Release #5950. Proposed revisions to management remuneration disclosures including specifically management perquisites.
December 4, 1978	SEC	Release #6003. Final amendment to disclosure of perquisites in management remuneration tables.
1978	IRS	Corporate tax return form requiring line item for deductions for travel and entertainment—enforce to 1978 tax year.
January 15, 1979	SEC	Perquisite disclosure is required in SEC proxy and registration statements filed after this date.
1979	IRS	Release of perquisite audit guidelines by IRS to IRS agents.

* Management perquisites are distinct from fringe benefits. Fringe benefits are benefits available to all employees while management perquisites (personal benefits) are available only to executives and directors.

disclosure of management remuneration both in proxy statements and in information statements filed with the Commission. A final amendment to these regulations, Securities Act Release No. 6003, was issued on December 4, 1978 effective for filings after January 15, 1979. This act rquired that additional management remuneration information on personal benefits be disclosed (excluding those benefits which are available to all company employees) in a specified tabular format and be included in registration statements, periodic reports, and proxy or information statements. Thus, perquisites received in the year 1978 and future years had to be disclosed beginning with the Spring, 1979, registration statements.[9] Securities Act Release No. 6003 was amended to provide a separation of options and rights exercised from benefits (perquisites) received for the fiscal year ending in 1980.

IRS Regulations

The Internal Revenue Code of 1954, Section 61, defines gross income as all income no matter what its source, unless excluded by law. This includes income realized in the form of money, property, or services. If services are compensated in a form other than money, the fair market value of the property or services taken in payment must be included in income.[10] Although the IRS required that all fringe benefits be taxed, enforcement of this ruling was reportedly lax until the late 70's.[11] In September 1975, the Treasury Department issued a discussion draft of proposed regulations that would govern the tax status of fringe benefits available to all employees (as opposed to perquisites available only to a selected group). The stated purpose was to provide comprehensive guidelines that would afford greater degrees of certainty, uniformity, and fairness in the tax treatment of employee-furnished benefits. It was not limited to executive perquisites.

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[9] An exclusion exists for certain personal benefits where the registrant could not determine without unreasonable cost or effort the specific amount of personal benefits or the extent to which benefits are personal rather than business. A footnote is required to explain why personal benefits were not included.

In 1977, the IRS included a new line item on the corporate income tax return (Form 1120) requiring disclosure of the total amount of deductions claimed for travel and entertainment, gifts, and similar items. Companies responded negatively to this regulation arguing that no prior notice had been given and that corporate accounting systems were, therefore, not prepared to produce the data requested. The IRS responded by permitting companies to omit this line item for 1977 but required it beginning in 1978. In 1979, substantial new material directed toward auditing perquisites was added to the IRS Audit Technique Handbook available for the audits of 1978 taxes,[12] indicating that the IRS was encouraging its agents to examine perquisite income.[13]

Other Regulations

Two other regulations which may affect compensation for the years under study are considered in this section. The Tax Reform Act of 1976 repealed the preference treatment afforded qualified stock options. The options granted from plans in effect prior to May 20, 1976 must be held for a minimum of three years and exercised before 1981 to obtain capital gains treatment. Option plans adopted after that date are considered non-qualified and require ordinary tax treatment. However, there is no *a priori* reason to expect that changes in compensation resulting from the exercise or the granting of these options would affect compensation more in one year than in any other year between 1976 and 1981. This paper examines changes in cash compensation paid in 1978 and the results are not expected to be sensitive to the Tax Reform Act of 1976.

The maximum corporate tax rate changed from 48 percent in 1978 to 46 percent in 1979. This potential tax savings could be passed to shareholders or could be used to increase salaries/ bonuses or some combination of both. However, there is no *a priori* reason to expect one firm to be affected more than any other firm. Since the present analysis uses companies from many different industries and has both a control group and a treatment group, the results are not expected to change due to the change in the corporate tax rate. The maximum personal tax rate remained unchanged for the years studied.

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[10] Internal Revenue Code, 1954, Section 61, Commerce Clearing House, p. 113.

[11] See Gibbs and McClure [1979] and Wiesen and Eng [1979] for further elaboration and documentation of the laxity.

[12] Michael F. Klein, Jr. "Executive Perquisites," *Financial Executive* (March 1979), p. 24.

[13] The Treasury Department issued a discussion draft on the taxation of fringe benefits and, in 1979, Congress passed a bill which declared a moratorium on the issuance of additional regulations concerning the taxation of fringe benefits (benefits available to all employees). The moratorium has expired and no new legislation has been issued. This has not stopped the IRS from evaluating perquisites on an individual case by case basis. Recent cases include: Playboy Enterprises, Richford Industries, and Potter Instrument Company.

Timing of Effects

It is presumed that CEOs are aware of possible changes in tax regulations and disclosure requirements. Activity regarding the regulation and taxation of perquisites started in 1977 with the SEC's first release on August 18, 1977 and the IRS's attempt to enforce a new line item on the corporate tax return in 1977. Thus, we would expect companies to anticipate the impending regulations and adjust compensation contracts to incorporate changes for the fiscal year 1978. It is doubtful, due to compensation contracts in force and the difficulty of rapidly adjusting perquisites such as apartments, that a change in compensation would be observed prior to 1978. During 1978, both the SEC's disclosure law and the IRS's line item took effect. Consequently, it is expected that the major effect of these regulations would be observed in 1978.

DATA AND CONTROL ISSUES

The objective of this study is to assess empirically the joint impact of the SEC's perquisite disclosure requirement and of increased IRS activity on CEO's real cash compensation. It is hypothesized that due to the joint regulations managers substituted cash compensation for perquisites and/or received an increase in cash compensation to compensate for the loss in after-tax income.

To examine this hypothesis, a prediction model is developed and prediction errors are evaluated. The variables used in the prediction model, the rationale for their use, and potential control problems are discussed in this section.

Sample Selection

Three hundred firms were randomly chosen from the Fortune 1,000 companies. Cash compensation (cash salary, bonus, and director's fees), and perquisites were obtained from the companies' proxy statements. The COMPUSTAT file (1980) was used to obtain the companies' financial information. Of the 300 firms, 160 firms had availale: 1) a proxy or registration statement in each year, 1970 through 1980, and 2) data on the COMPUSTAT (1980) file.

An analysis of the proxy statements for fiscal year end 1978 revealed that few firms disclosed perquisite information and many of the firms' disclosures were footnotes to the compensation table. For fiscal year 1979, perquisite information was combined in the table with information on stock options. For both 1978 and 1979, footnotes were used to assess the range or dollar amount of perquisites declared. Only in 1980 were the actual perquisite dollar amounts disclosed separately. A total of 85 companies reported positive levels of perquisites for years 1978, 1979, and 1980. These 85 companies are designated as Group 1. Of these 85 companies, a sub-group of 32 firms provided enough information in their footnotes and compensation tables to assess the dollar amount (as opposed to the range) of the perquisites. The dollar amount of perquisites disclosed for this sub-group will be used later in the paper to analyze the "wealth" and "substitution" effects on the CEO's cash compensation. A second group of 49 companies provided information that no perquisites were paid to their CEO during 1978, 1979, and 1980. This group of 49 companies is designated as Group 2. Group 1 and Group 2 are used to analyze the relation between compensation, perquisite disclosure requirements, and tax laws. Before 1978, no disclosure of perquisites was found for the sample firms.

It is assumed here that the companies in Group 2 (perquisites equal to $0) did not supply perquisites to their CEO prior to 1978 whereas companies in Group 1 did provide their CEOs with perquisites before 1978.[14] Group 2 companies are therefore expected to be unaffected by the regulation and are used as a control group.

The other companies in the initial sample (26 firms) had mixed reporting of perquisites from 1978 through 1980. Due to these reporting inconsistencies, these companies are eliminated from the analysis.

Potential Control Problems

We are interested in examining the relative changes in cash compensation between Groups 1 and 2. However, a control problem exists if Group 2 CEOs received perquisites prior to 1978. We would then expect their cash compensation to increase in subsequent years as we hypothesize for Group 1. Thus, we would not expect to find a significant difference between the two groups when compensation shifts are examined in the post-disclosure period. Alternatively, if Group 2 is systematically different from Group 1 and instead of shifting from perquisites to cash compensation, this group shifted to other forms of compensation (e.g., deferred compensation or options), the method used in this paper would not detect this shift. Under this alternative scenario, Group 1 would experience an increase in cash compensation, Group 2 would experience no change in cash compensation, and a difference between the two groups would still be detected. Thus, detection of a significant difference between the two groups does not support the proposition that Group 1 was unaffected by the change in regulations. It implies instead that Group 1's cash compensation was unaffected.

To allow assessment of effects of other factors on compensation, an analysis of industry membership, turnover of CEOs for each group, and group characteristics is presented. In addition, several explanatory variables are used in the study to help control for other effects on compensation.

Studies by Mruk and Giardina [1972, 1976, 1979] document different industry compensation practices. An analysis of industry membership of the companies in each group indicated wide dispersion. The 134 sample companies have membership in 35 industries.[15] In no instance did the industry membership of one group exceed the other group's membership by more than three companies. The largest industries represented are banks (9), chemicals (10), machinery (10), and retail stores (11). Otherwise, the industry membership for both groups is six or less.

An additional control problem might exist if Group 1 changed CEO's more frequently than Group 2—particularly in the year of interest, 1978. Since newly appointed CEOs tend to have a higher salary and bonus than the outgoing CEO, an upward bias in the change in compensation might exist. An analysis of the data revealed that Group 1 had four CEO turnovers (4.7 percent) in 1978 and Group 2 had two changes (four percent) in the CEO.[16]

Table 1 provides descriptive statistics on the dollar amount of cash compensation, the amount of perquisites dis-

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[14] Self-selection bias exists since, it is presumed, that the CEO chooses the compensation scheme with or without perquisites.

[15] An industry is defined by the four digit SIC code as listed on the 1980 COMPUSTAT file.

[16] The results found in the study were not sensitive to dropping the companies with CEO changes during the years 1977, 1978, 1979, and 1980.

TABLE 1

SUMMARY OF COMPENSATION AND PERQUISITE AMOUNTS DISCLOSED IN PROXY STATEMENTS

	1977		*1978*		*1979*		*1980*	
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*
Panel A—Summary statistics for Group 1, the 85 companies that reported positive perquisites in 1978, 1979, and 1980.								
85 Companies								
Cash Comp*	370,650	138,400	434,758	146,637	479,290	159,682	511,682	185,080
Deflated Comp	204,210	76,260	222,498	75,049	220,470	73,260	207,480	74,770
Perquisites	NA**	NA	NA	NA	NA	NA	38,760	36,061
Deflated Perks	NA	NA	NA	NA	NA	NA	15,704	14,853
Perks/Comp	NA	NA	NA	NA	NA	NA	7.5%	
Panel B—Summary statistics for the sub-sample of 32 companies in Group 1 that disclosed the dollar amount of perquisites in 1978, 1979, and 1980.								
32 Companies								
Cash Comp*	362,718	140,576	441,656	169,715	460,594	180,124	514,062	191,718
Deflated Comp	199,844	77,452	226,024	86,856	211,864	82,854	208,290	77,681
Perquisites	NA	NA	55,207	35,016	NA	NA	38,406	36,442
Deflated Perks	NA	NA	28,253	17,920	NA	NA	15,561	14,766
Perks/Comp	NA	NA	12.5%		NA	NA	7.6%	
Panel C—Summary statistics for the 49 companies in Group 2 that disclosed $0 paid in perquisites in 1978, 1979, and 1980.								
49 Companies								
Cash Comp*	260,630	106,560	293,939	142,747	334,480	136,571	357,310	170,916
Deflated Comp	143,600	58,710	150,430	73,048	153,859	62,819	144,788	69,260
Perquisites	NA	NA	0	0	0	0	0	0
Deflated Perks	NA	NA	0	0	0	0	0	0
Perks/Comp	NA	NA	0	0	0	0	0	0

* Cash Compensation (Cash Comp) is the amount of undeflated cash compensation paid to the CEOs defined as salary, bonus, and director's fees. Deflated Comp is the real dollar cash compensation paid to the CEOs. Perquisites is the undeflated amount of perquisites reported in the proxy statements. Deflated Perks is the real dollar value of the perquisites reported in the proxy statements. Perks/Comp is the dollar amount of the reported perquisites divided by the dollar amount of cash compensation.

** NA means that the data are not available.

closed, and the percentage of perquisites to cash compensation for the sample of 134 companies. In 1980, the 85 companies (Group 1) in Table 1, Panel A, disclosed a perquisites to cash compensation ratio average of 7.6 percent, undeflated perquisites averaged $38,760 (CPI deflated averaged $15,704), and undeflated cash compensation averaged $511,682. The sub-sample of 32 companies (Table 1, Panel B) that reported a dollar value of perquisites in 1978 averaged 12.5 percent of perquisites to cash compensation paid. For these 32 companies, perquisites averaged $55,207 (deflated averaged $28,253), and undeflated cash compensation averaged $441,656. Comparing the 1980 averages of the full sample of 85 companies to the 1980 averages of the sub-sample of 32 companies reveal very similar amounts. When the means and standard deviations for the sub-sample of 32 companies are compared to the means and standard deviations of the 53 (85 − 32) remaining companies in Group 1 no significant differences are found indicating consistency within the sample group. The compensation amounts and the dollar value of the disclosed perquisites reported in Table 1 will be used later in the paper to analyze unexpected changes in cash compensation.

For the 49 Group 2 companies, mean undeflated compensation (Table 1, Panel C) is \$293,939 and \$357,310 for 1978 and 1980, respectively. Compensation paid to Group 2 CEOs is significantly less than the compensation paid to Group 1 CEOs. The sizes within the two groups—measured by sales, net income, and total assets—are also significantly different at at least the one percent level.

The Dependent Variable

We are interested in evaluating the change in real compensation due to perquisite disclosure and tax policy. Thus, two adjustments are made to cash compensation. First, the cash compensation of the CEO is deflated by the consumers price index. Second, the dependent variable examined is the change in the natural log of real compensation, i.e.,

$$\ell n(COMP_{i,t}) - \ell n(COMP_{i,t-1}) = \ell n(COMP_{i,t}/COMP_{i,t-1}),$$

where i is the company and t is the year.

There are several benefits to using changes in the log of compensation (*LCOMP*) when estimating compensation. Using the log of compensation reduces problems that are due to differences in the size of the variables across firms. The log formulation is consistent with previous studies on compensation. Omitted variables that influence the level of compensation in each time period, which are themselves unchanging over time, will drop from significance when first differences are used. To the extent that these omitted factors are constant through time, they will be captured in the intercept term. In addition, cross-sectional correlations for changes in the log of compensation and for changes in the log of performance measures are stronger than correlations which exist for the levels of compensation [Murphy, 1985], and the higher correlations result in an improved prediction model.

Independent Variables

Several empirical studies have examined the relation between compensation and other variables. These studies include: Masson [1971], Lewellen and Huntsman [1970], McLaughlin [1975], Crystal [1978], Mruk and Giardina [1972, 1976, 1979], Williamson [1963], Healy [1985], and Murphy [1985]. Based on results of these studies, reported net income, sales, and return to common equity are used as independent variables. Inclusion of these variables is intuitively appealing since many compensation contracts for chief executive officers include one or more of these variables.

The rate of return to common equity is defined as

$$R_t = \frac{P_t + DPS_t}{P_{t-1}} - 1,$$

where P_t and DPS_t are the closing stock price and dividends-per-share paid in fiscal year t, adjusted for stock dividends and splits.

An additional independent variable used in this study is the standard deviation of net income. Although no formal theory exists tying compensation to the standard deviation of net income of a company, we would expect the manager of a company operating in a volatile environment to be paid more than one whose company operates in a stable environment. Here, the standard deviation of net income acts as a surrogate for risk capturing both firm specific and economy wide influences on the company. A positive association is expected between our risk surrogate and compensation.[17] The standard deviation of net income was calculated using a ten-year moving average which includes the year in which compensation is based. For example, real net income from the years 1962 through 1971 inclusive was used to calculate the standard deviation of net income for the year 1971 for each company. Real net income from the years 1963 through 1972 inclusive was used to calculate the standard deviation of net income for the year 1972, etc.

Since we are interested in predicting changes in the natural log of compensation, and to be consistent with both the form of the dependent variable and previous studies, changes in the natural log of income, sales, and the standard deviation of net income are used as independent variables. The rate of return to common used as an independent variable is the continuously compounded real rate of return. This corresponds to a percentage change in price (including dividends) and is consistent with the percentage change interpretation of the other variables. Positive changes in these variables are expected to be associated with positive changes in compensation.

CEO compensation contracts usually stipulate a base salary amount to be paid during the course of the year and a bonus paid at the end of the year after managerial performance has been evaluated. Thus, we would expect the bonus award to be correlated with current performance measures while we would not expect salary to be strongly related to current performance measures. If the CEO receives an increase in compensation in response to the change in perquisite disclosure, this increase can manifest itself in two ways: an increase in salary, which will lead to an increase in the regression intercept; and/or an increase in bonus, which will lead to a change in the slope coefficients.

There are theoretical reasons for believing that an assumption of a constant intercept and slope for all years across all companies is not appropriate. For instance, Adams [1987] finds evidence that firms operating in a risky environment are more likely to make their compensation less sensitive to performance variables (i.e., lower slope coefficients) to shield their managers from risk. Table 1 provides some evidence that companies in Group 1 are larger than those companies in Group 2. Taking changes in the log of these variables reduces these differences considerably. However, due to different operating environments and different firm characteristics for the two groups, we would expect changes in both intercepts and slopes to occur over time. Furthermore, we know that the two groups of companies have different compensation schemes since only one group provides perquisites. Therefore, we would expect both the intercepts and slopes to be different between the two groups and across time.[18] Ideally, we would prefer to let the parameters of the regression model be firm specific to capture changes between companies and across time. However, this is not feasible due to inadequate degrees of freedom. The alternative approach taken here, for the prediction equations, is to permit the parameters to vary between the groups and across time.[19]

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[17] Several surrogates for risk were analyzed including variance in net income, unsystematic risk, and beta, and the results were virtually identical.

[18] Cross-sectional regressions for each group indicate that the slopes and intercepts are different between the groups and that the slopes and intercepts do change over time.

MODEL

A regression model is formulated to test for a change in the log of the real cash compensation of the CEO. Measures of executive compensation, net income, sales, and price per common share were deflated by the consumer price index at the end of year t. The natural log of these variables was then differenced in order to evaluate the real change in the log of executive cash compensation. If real earnings are negative, the log of net income is assumed to be zero. This implies that earnings-based bonuses are paid only when the firm earns real profits and the CEO does not receive a negative bonus. Sixteen of the 134 companies (24 firm-years) are adjusted in this way (ten from Group 1 and six from Group 2).

The compensation model is:

$$LCOMP_{it} = a_{jt} + b_{jt}LEARN_{it} + c_{jt}LSALES_{it} + d_{jt}LRC_{it} + f_{jt}LESTD_{it} + e_{it}$$

$$i = 1,2,\ldots,134;\quad j = 1,2;\quad t = 1971,1972,\ldots,1980$$

where

$LCOMP_{it}$ = change in natural log compensation for company i in year t.
$= \ell n(COMP_{i,t}) - \ell n(COMP_{i,t-1}) = \ell n(COMP_{i,t}/COMP_{i,t-1})$

$LEARN_{it}$ = change in natural log net income ($EARN$) for company i in year t.
$= \ell n(EARN_{i,t}) - \ell n(EARN_{i,t-1})$

$LSALES_{it}$ = change in natural log sales ($SALES$) for company i in year t.
$= \ell n(SALES_{i,t}) - \ell n(SALES_{i,t-1})$

LRC_{it} = change in natural log common stock price (dividend adjusted) or the continuously compounded rate of return on common stock for company i in year t.
$= \ell n(1 + R_{i,t}) = \ell n(P_{i,t} + DPS_{i,t}) - \ell n(P_{i,t-1})$

$LESTD_{it}$ = change in the natural log of the standard deviation of net income ($ESTD$) for company i in year t.
$= \ell n(ESTD_{i,t}) - \ell n(ESTD_{i,t-1})$

e_{it} = the disturbance term for the regression of company i in year t.

The model was estimated for 134 companies using ten years of data, 1971 to 1980 inclusive. Changes for 1971 were computed using data from 1970. Table 2, Panel A, reports regression results restricting the coefficients to be constant across years and across the two groups. The coefficient on the change in the log of real net income is .041, indicating that a ten percent increase in the change in the log of real net income (*LEARN*) corresponds to a .41 percent increase in the change in the log of real compensation

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[19] Healy and Palepu [1985] and Healy, Kang, and Palepu [1987] use a dummy variable for both the intercept and slope terms for each firm with the log of earnings as the independent variable.

TABLE 2

ESTIMATED COEFFICIENTS FROM REGRESSION OF THE CHANGE IN THE LOG OF REAL COMPENSATION ON THE CHANGE IN THE LOG OF: NET INCOME, SALES, COMMON STOCK PRICE, AND STANDARD DEVIATION OF NET INCOME*

				Coefficients for the Change in the Log of			
	N	*Independent Variable*	*Intercept*	*Net Income*	*Sales*	*Common Price*	*Std. Dev. of Net Income*
Panel A—All Companies	134	*LCOMP*	.004 (.59)	.041 (7.24)	.324 (6.68)	.052 (2.19)	.017 (1.67)
			R^2=.21	*F*=3.34		*PROB.*>*F*=.0001	
Panel B—Group 1	85	*LCOMP*	.005 (.62)	.031 (3.899)	.421 (5.831)	.046 (1.418)	−.013 (−.36)
			R^2=.08	*F*=15.54		*PROB.*>*F*=.0001	
Panel C—Group 2	49	*LCOMP*	−.0004 (−.05)	.055 (7.38)	.217 (3.67)	.071 (2.18)	.055 (1.71)
			R^2=.17	*F*=23.86		*PROB.*>*F*=.0001	

* Panel A, Panel B, and Panel C are the regression results from the cross-sectional, time-series regression for years 1971 through 1980 for all 134 companies, Group 1 (85 companies which reported positive $ perquisites), and Group 2 (49 companies which reported $0 perquisites), respectively.

LCOMP is the change in the log of real compensation.

The numbers in parentheses are the *t*-statistics for the coefficients.

(*LCOMP*), holding the other independent variables constant. Analogously, holding the other independent variables constant, a ten percent increase in the change in the log of real sales (*LSALES*) implies a 3.24 percent increase in *LCOMP*. Whereas, a ten percent increase in the change in log common stock price (*LRC*) and a ten percent increase in the change in the log of the standard deviation of net income (*LESTD*) corresponds to a .52 percent and a .17 percent change in *LCOMP*, respectively.

The independent variables are correlated, with correlations ranging from .20 for *LEARN* and *LRC* to −.12 for *LEARN* and *LESTD*. The only independent variables not significantly correlated are *LSALES* and *LESTD*. However, the following analysis focuses on regression residuals rather than significance tests for individual coefficients. Collinearity does not effect the residuals of the regression.

Panels B and C of Table 2 provide regression results for Group 1 and Group 2, respectively, across all ten years. Panels B and C restrict the coefficients to be constant across time, but allow them to vary between the groups. For Group 1, the coefficient for the standard deviation of earnings is not significantly different from zero while for Group 2 this coefficient is significant at the 4.4 percent level (one-sided), implying that the standard deviation of earnings will be more useful in predicting the change in log compensation for Group 2 than for Group 1.

The R^2 statistics for the three regressions shown in Table 2 are somewhat higher than those of previous studies using change in the log of compensation as a dependent variable due to the inclusion of more independent variables.[20]

Tests and Results

This section analyzes the prediction errors for all 85 companies in Group 1, the 32 from sub-sample of Group 1, and the 49 companies in Group 2. First, a comparison of the prediction errors across time and between groups is made. Next, there is a comparison of the real dollar differences between the groups. Using the 32 company sub-sample and the real dollar differences, the "wealth" and "substitution" effects on real cash compensation is analyzed.

The above regression model is used to formulate prediction errors for years 1977, 1978, 1979, and 1980. This method will detect increases (decreases) in the change in the log of compensation that result from both salary and bonus changes. Coefficients from the regression, using data from 1971 through 1976, were used to predict the change in the log of compensation for 1977. Coefficients using data from 1971 through 1977 were used to predict the change in the log of compensation for 1978, etc. Thus, for each predictive regression, the coefficients are changing over time and over groups. The estimated coefficients from these regressions were combined with the actual performance variables in the year being predicted to determine the predicted change in the log of compensation (*PC*) for that year.

Table 3 provides the means and standard deviations of the actual change in the log of real cash compensation ($LCOMP = \ln(COMP_t/COMP_{t-1})$) and the predicted change in the log of real cash compensation (*PC*) for years 1977 through 1980, for all 134 companies regressed together (Panel A). Panels B, C, and D of Table 3 show results for Group 1, Group 2, and the 32 firm sub-sample of Group 1, respectively. In order to interpret the results, the percentage increase in the change in the log of compensation and the predicted compensation are presented along with the dollar value of these changes. Dollar value is calculated by taking the percentage increase times last year's actual compensation.

For example, the results for Group 1 and Group 2 in the year 1978 are calculated and interpreted as follows. For Group 1, the actual 1978 change in the log of compensation (*LCOMP*) is .0973.[21] This is equivalent to a 10.22 percent increase in the real cash compensation actually paid in 1978 over the real cash compensation actually paid in 1977 for Group 1. The predicted change (*PC*) in the log of compensation for 1978 is −.0498 implying that the model predicted a decrease of −4.86 percent in real cash compensation in 1978. The prediction error (*PEC*) represents the difference between the actual percentage increase in real cash compensation and the predicted percentage increase in real cash compensation.[22] The 1978 prediction error for Group 1 is 15.08 percent $(10.22\% - (-4.86\%))$. If we use the actual 1977 real cash compensation of $204,210 to estimate the dollar value of the prediction error, the implied increase in real cash compensation is $30,789 $(15.08\% \times 204{,}210)$.

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[20] Previous studies using variables in the change in the log form are Murphy [1985, Appendix A, p. 42] and Coughlan and Schmidt [1985]. Their *R*-squares range from .04 to .10 based on only one or two independent variables.

[21] The antilog of the actual change in the log of compensation is 1.1022 ($e^{.0973} = 222.5/204.21$).

[22] The prediction error is based on the antilog calculations since subtracting differences in the log forms results in division.

TABLE 3

ACTUAL CHANGE IN THE LOG OF COMPENSATION, PREDICTED CHANGE, AND PREDICTION ERRORS FOR 1977 THROUGH 1980[a]

	1977				*1978*				*1979*				*1980*			
	Mean	*Std. Dev.*	*Percent Change*	*Dollar Change*	*Mean*	*Std. Dev.*	*Percent Change*	*Dollar Change*	*Mean*	*Std. Dev.*	*Percent Change*	*Dollar Change*	*Mean*	*Std. Dev.*	*Percent Change*	*Dollar Change*
Panel A																
All $n=134$																
LCOMP	0.046	0.160	4.67%	$ 8,120	0.074	0.195	7.68%	$ 13,983	0.007	0.201	0.71%	$ 1,398	−0.071	0.208	−6.83%	$−13,386
PC	−0.011	0.044	−1.06%	−1,851	−0.022	0.054	−2.15%	−3,908	−0.034	0.053	−3.31%	−6,500	−0.021	0.054	−2.05%	−4,018
PEC			5.73%	9,971			9.83%	17,891			4.03%	7,898			−4.78%	−9,368
Panel B																
Group 1 $n=85$																
LCOMP	0.058	0.170	6.01%	$ 11,584	0.097	0.180	10.22%	$ 20,868	−0.007	0.159	−0.72%	$ −1,596	−0.068	0.215	−6.53%	$−14,391
PC	−0.023	0.085	−2.27%	−4,380	−0.050	0.096	−4.86%	−9,921	−0.064	0.087	−6.24%	−13,877	−0.020	0.095	−1.58%	−3,478
PEC			8.29%	15,964			15.08%*	30,789*			5.52%	12,281			−4.95%	−10,913
Panel C																
Group 2 $n=49$																
LCOMP	0.024	0.140	2.39%	$ 3,349	0.034	0.215	3.43%	$ 4,922	0.032	0.259	3.23%	$ 4,861	−0.076	0.197	−7.33%	$−11,274
PC	−0.025	0.027	−2.43%	−3,408	−0.012	0.036	−1.14%	−1,642	−0.020	0.039	−1.58%	−2,373	−0.028	0.038	−2.78%	−4,278
PEC			4.82%	6,757			4.57%*	6,564*			4.81%	7,233			−4.55%	−6,996
Panel D																
Sub-group $n=32$																
LCOMP	0.064	0.180	6.61%	$ 12,389	0.122	0.179	12.95%	$ 25,885	0.060	0.137	−5.84%	$−13,205	−0.008	0.188	−0.78%	$ −1,646
PC	−0.038	0.041	−3.05%	5,717	−0.068	0.047	−6.60%	−13,194	−0.067	0.042	−6.52%	−14,732	−0.027	0.035	−2.66%	−5,633
PEC			9.66%	18,106			19.55%*	39,079*			0.68%	1,527			1.88%	3,987

[a] Panel A, Panel B, Panel C, and Panel D of this table provides the means and standard deviations of the actual change in the log of compensation (*LCOMP*) and the predicted value of the change in the log of compensation (PC) for all 134 companies together, Group 1 (85 companies which reported perquisites), Group 2 (49 companies which reported $0 in perquisites), and the Group 1 sub-group (32 companies, which disclosed a dollar amount of perquisites in 1978), respectively. The antilog minus one (Percent Change) was computed for the mean log values representing the percentage change in real cash compensation. The last column in each year represents the real dollar change in cash compensation over the previous $(t-1)$ year. The prediction error (PEC) represents the unexpected change in compensation.

* Significantly different at the 1 percent level (one-tailed test). None of the other prediction errors are significantly different at the 10 percent level or less.

Analogously, Group 2's actual 1978 change in the log of compensation is .0337, a 3.43 percent increase in the real cash compensation compared to 1977. The predicted change in the log of compensation for 1978 is −.0115, a decrease of −1.14 percent in real cash compensation for the year. The 1978 prediction error for Group 2 is 4.57 percent. This equates to a $6,564 increase in real cash compensation for the year. The unexpected difference in compensation for Groups 1 and 2 is 10.51 percent (15.08% −4.57%) in percentage terms, and in real dollar terms the difference is $21,462 ($41,976 in nominal dollars).

The results (a 15.08 percent unexpected increase in cash compensation) for Group 1 (those companies that reported perquisites), implies that a significant and positive shift occurred in salary and bonus for the year 1978. Furthermore, after adjusting for the percentage increase in cash compensation of the control group (Group 2) we still observe a net positive and significant increase in cash compensation of 10.51 percent for the firms which reported perquisites.

Results for the 32 companies reporting a separate amount for perquisites in 1978, are also reported in Table 3. The 1978 prediction error for the 32 companies is 19.55 percent.[23] This equates to a $39,079 increase in real cash compensation. The increase in cash compensation for CEOs of these firms relative to managers of Group 2 firms is $29,937 in real dollars and $58,551 in nominal dollars.

The highest actual increase in compensation for all groups occurred in 1978. Prediction errors for Group 1 and its sub-sample of 32 companies are larger than in any other year. The prediction error for Group 1 is significantly different from Group 2 at the one percent level of significance using a standard *t*-test for the difference between two means.[24] The sub-group of 32 companies is also significantly different from Group 2 at the one percent level. None of the other years indicate a significant difference between the two groups. In 1979 and 1980, the prediction errors for Group 1 and Group 2 are very similar. However, the prediction errors for the 32 company subsample in 1979 and 1980 are relatively small at less than two percent.

The significant and positive shift in unexpected real compensation for Group 1 and the 32 firm sub-sample relative to Group 2 supports the proposition that the joint regulatory effect resulted in higher cash compensation being paid in 1978 to the CEOs receiving perquisites. Furthermore, an analysis of the prediction errors for Group 2 indicates that the prediction error is relatively stable around 4.5 percent for all years except 1980. If Group 2 paid perquisites prior to the 1978 disclosure law, we would have expected to see some shift in the prediction error for 1978 and we do not observe such a shift. This provides support for the assumption that Group 2 did not provide perquisites prior to 1978.

The prediction errors are not significantly different in 1979 or 1980. However, there is a significant decrease in compensation and the associated prediction error during the year 1980 for all groups and a decrease in compensation

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[23] This prediction error was calculated from the model using only the 32 companies. The prediction errors and results are very similar to those found from using all 85 companies.

[24] Kmenta, *Elements of Econometrics* (New York: Macmillan, 1971), p. 372.

The test statistic is: $\frac{B_i - B_j}{S_{B_i - B_j}}$

where

$$S_{B_i - B_j} = SQRT[(n_i - 1)\,Var(B_i) + (m_j - 1)\,Var(B_j) \\ -2Cov(B_i, B_j)].$$

in 1979 for Group 1 and the 32 company sub-group.[25]

Disclosure of the dollar value of perquisites made by the 32 company subsample permits an analysis into the "wealth" and "substitution" effects on compensation from the joint regulatory actions. The average real dollar value of the perquisites reported for the CEOs of the 32 companies in 1978 was $28,253. The reported perquisites nominal value averaged $55,207. Based on the empirical analysis and after adjusting for the control group's percentage increase, the unexpected increase in compensation for the 32 companies was $29,937. As noted earlier, assuming: 1) only a "wealth" effect; 2) an equal dollar value for the perquisites paid before and after the disclosure requirement; and 3) a 50 percent tax rate, we would expect real compensation to increase by an amount equal to the perquisites provided. The 1978 difference between the real dollar adjusted increase of $29,937 and the reported real dollar perquisites of $28,253 is $1,684.[26] Since the perquisites paid in 1977 are not observable, we are unable to determine the source of the discrepancy. The discrepancy may be due to control problems, measurement problems, the assumption of the same amount of perquisites before and after the disclosure law, and/or the substitution of perquisites for other forms of compensation. One feasible explanation which is consistent with the positive discrepancy of $1,684 and with our expectations is that the dollar value of perquisites paid in 1977 exceeded those paid in 1978. Therefore, a shift from perquisites to cash compensation (and possibly other forms of compensation) may have occurred.

Consistent with our hypothesis, we observe the largest changes in real cash compensation occurring in 1978. If some perquisites are not easily substituted or require time to adjust (e.g., apartments), we may observe part of the effect in future years. If this delay is assumed to exist, then holding the "wealth" effect constant, we can *approximate* a "substitution" effect by analyzing results for the 32 firm sub-sample. The "substitution" effect on perquisites is approximated by taking the decline in perquisites from 1978 to 1980 and comparing this to the increase in unexpected real cash compensation between 1978 and 1980. In 1980 the actual real dollar value of declared perquisites for the 32 firms was $15,561. The 1980 increase in real cash compensation for CEOs of these 32 firms relative to managers of Group 2 firms is $15,911 ((2.96% − (−4.55%)) × 211.864). The 1979 increase in cash compensation for CEOs of these 32 firms relative to managers of Group 2 firms is −$9,335 ((.68% − 4.81%) × 226,024). The total two year change in real dollar cash compensation is $6,576. The total two year change in reported (deflated) perquisites for the 32 firms is $12,692 (28,253 − 15,561). This $12,692 change represents the additional decrease in perquisites. When compared to the relative increase in cash compensation over the two year period, we can infer a substitution of $6,576 in real cash compensation for real dollar perquisites. The unexplained portion of $6,116 may be the result of substitution into other forms of compensation, measurement error, or the corporations not absorbing the full amount of the decline in perquisite income. Overall, both the amounts and the direction of both the expected

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[25] The decreases in real compensation and the prediction errors that appear in Table 3 for 1979 and 1980 are functions of the decreases in the real values of the control variables. The effects of inflation on CEO compensation are beyond the scope of this paper.

[26] This is not significantly different at a one-sided ten percent level using the different-in-means test.

"wealth" and "substitution" effects are consistent with the hypothesis of a change in cash compensation resulting from the SEC disclosure requirement and the IRS taxation policy.

Rank-Order Correlations

Additional evidence is presented on the relation between reported perquisites and unexpected compensation. We would expect that the CEOs with the largest amount of perquisites to have the largest increase in cash compensation. A test which correlates the size of the prediction errors (the unexpected increase in compensation) with the reported perquisites (adjusted for inflation) enables us to more precisely test 1) whether the size of the compensation increases observed in the empirical tests is related to taxation of perquisites, and 2) whether the decrease in perquisites between 1978 and 1980 is related to taxation of perquisites. For both Group 1 and the 32 firm subgroup, the Spearman rank-order correlation,[27] and the associated one-sided significance level (in brackets) was estimated. Real dollar prediction errors are correlated with real dollar disclosed perquisites. For the 32 companies reporting dollar amounts in 1978, the rank-order correlation for reported perquisites in 1978 with the associated 1978 prediction errors is .39 (1.7 percent level of significance). For the 85 companies in Group 1, the rank-order correlation for the 1980 reported perquisites with the 1980 prediction errors is .17 (significant at the 6 percent level). These correlations indicate that both the magnitude and the sign of the perquisites actually paid is related to the prediction error size, and, by association, to the taxation of perquisites. These results provide additional support that the observed increase in compensation is related to taxation of perquisites.

Overall, both the prediction error results from the mean tests, and the correlation results support the hypothesis that a change in compensation occurred in 1978, coincident with the perquisite disclosure regulation and with changes in tax policy.

VI. CONCLUSIONS

Issuance of the SEC perquisites' disclosure regulation, combined with the IRS tax policy of taxing perquisites as income, provided the opportunity to study the impact of two related government regulations. If perquisites, prior to the disclosure law, were considered an alternative method of compensating the CEO, their taxation would result in a decrease in their desirability. It is reasoned that a decrease in the desirability of perquisites would result in a shift out of perquisite compensation into cash compensation. Since perquisites exist even after their taxation, it appears that perquisites are a component of compensation which do not exist solely for the purpose of tax minimization.

Overall, for the sample companies in this study, the empirical results support the alternative hypothesis that the level of real compensation paid to the CEO of companies which reported perquisites has increased since the SEC perquisite disclosure regulation and IRS tax enforcement policy shifted. A shift in management's cash compensation was observed for the 85 firms studied.

As a by-product of the SEC disclosure rule, our evidence suggests that compliance with the tax code was enhanced.

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[27] The Pearson correlation was also estimated with very similar results. In addition, the percentage of perquisites to compensation was correlated with the percentage prediction errors. These results were identifical to the results presented for the levels. The levels results were presented due to ease of interpretation.

This is so because the SEC rule was made part of regulation S-K, which carries with it fraud penalties for failure to report accurately. Consequently, the IRS has an additional source available when examining perquisites declared by the CEO.

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Variable Cost Allocation in a Principal/Agent Setting

Robert P. Magee

ABSTRACT: A principal-agent relation is analyzed where the agent chooses an unobservable effort level *and* an observable level of utilization of a resource supplied by the principal. When the agent has private information about the usefulness of the principal's resource, it is shown that the optimal compensation function must include the resource level as an argument. That is, some form of "cost allocation" appears to be part of the optimal solution to the principal's problem. Further analysis shows that standard cost allocation techniques (where the agent is allocated more costs if he or she uses more of the resource) may not be efficient in motivating the agent's choices. In some circumstances, it may be optimal to pay the agent more if he or she used more of the principal's resource.

While the topic of cost allocation has received a great deal of attention in the accounting literature, it has been difficult to develop an analysis in which the process of cost allocation produces a benefit to the organizational entity. As Zimmerman [1979] points out, many papers identify "neutral" cost allocations, i.e., accounting allocations that do not harm the organization by changing the decisions made by those receiving the allocation. Examples are allocations based on mathematical programming such as Kaplan and Thompson [1971], Kaplan and Welam [1974], and those based on cooperative game theory such as Jensen [1977] and Hamlen et al. [1977]. When examined from an information economics perspective, these allocations produce no benefit because the "allocator" must know the optimal resource allocation decision before making the cost allocation. Therefore, there is nothing (explicitly modeled) to be gained by the *ex post* allocation of costs: the allocator could do just as well by specifying the usages of the organization's resources and forgetting about the allocations of costs.

The analysis in this paper examines the principal's efforts to manage an agent's use of central resources through an incentive function, and tries to determine whether commonly-used cost allocation procedures appear consistent with efficient incentive functions. Results show that efficient incentive functions can exhibit properties that are contrary to most cost allocation procedures. For in-

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Robert P. Magee is Eric L. Kohler Professor of Accounting and Information Systems at the J. L. Kellogg Graduate School of Management, Northwestern University.

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stance, it is shown that, under some circumstances, it may be efficient to pay the agent a higher compensation when he or she has used more of the central resource.

Section I presents a discussion of cost allocation issues in a principal/agent context. The cost allocation model is described in section II, along with some results about the optimal incentive contract. Section III shows results of two examples where it is optimal to pay the agent a higher compensation for using a higher level of the principal's resource. The implications of these results are discussed in section IV, and a brief summary is given in section V.

I. Cost Allocation in an Agency Framework

Analysis of cost allocation from an agency theory perspective (Demski [1981], Biddle and Steinberg [1984], and Demski and Sappington [1986]) identifies the organizational environment needed to address some of the basic questions about these allocations. The agency model consists of a principal who delegates some decision making authority to an agent, with the resulting actions affecting the likelihood of productive outcomes (sales, contribution margin, output, etc.). The need to provide incentives to an agent derives from two factors: the unobservability of the agent's action and the presence of a conflict in tastes for that action between the principal and agent (see Ross [1973], Holmstrom [1979], Shavell [1979], and Baiman [1982]). If the agent's action is observable, then the principal and agent can contract on the action as on any other commodity and there is no need to motivate the agent by basing an incentive function on the outcome of the agent's action.[1] A similar situation occurs when there is no difference in tastes regarding the agent's action, e.g., when the action is an effort level and the agent is not effort averse. In this situation, the principal can simply request that the agent choose the course of action that is best for the principal and the agent will comply because he or she has no reason to do otherwise.

These two factors are particularly important when considering cost allocation where the agent has the authority to decide how much to use of a resource provided by the principal. First, if it is possible to allocate costs based on the quantity of resource used, then it must be the case that the quantity used is observable to the principal. Therefore, it is possible for the principal to choose the level of resource utilization, and to compensate the agent on compliance with that choice. As shown by Demski and Sappington [1986], the only reason to delegate the choice of resource utilization is that the agent could have superior information concerning the benefits arising from its use. Also, if use of the resource imposes no nonpecuniary effect on the agent, it is possible for the principal to request that the agent choose the resource level that produces the greatest net benefit for the principal. However, if the resource could be used by the agent to substitute for unobservable effort, then an incentive conflict can arise that may be managed by some form of cost allocation.

Before proceeding to details of the model, it is necessary to be specific about the definition of "cost allocation" to be used in the agency analysis. In the canonical agency model, the agent's action and a random event result in an outcome x which can be observed by both the principal and the agent. This outcome is used in the incentive function, $s(x)$, to motivate the agent's choice of action. In a model encompassing cost allocation, the agent's decisions include the choice of a resource level y which (i) affects the probability distribution of x, and (ii) causes the principal to incur costs of $C(y)$. Cost allocation usually involves the choice of a function $c(y)$ so that the agent's incentive can be based on a new performance measure, $x-c(y)$, with some benefits arising from using $x-c(y)$, rather than x alone.

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[1] Risk-sharing would provide the only rationale for basing the agent's compensation on the outcome.

In the first agency theory model in the accounting literature, Demski [1972] views the principal as choosing an incentive function *and* a performance measure. Therefore, the principal would decide whether to allocate fixed costs, whether to base allocations on "cause-and-effect" or "ability-to-bear," whether to allow one agent's allocation to depend on outcomes in other responsibility centers, etc., [Suh, 1987]. Allocation issues are defined at the level of a summary performance measure on which the incentive function is defined.

However, current analysis of contracting between principal and agent would dictate that an incentive function based on $x-c(y)$ is efficient only when $x-c(y)$ is *sufficient for* x *and* y *with respect to the agent's action choice* [Holmstrom, 1979]. Clearly, such sufficiency would not be expected to hold in all situations,[2,3] so the researcher is faced with a difficult choice. Analysis of the agency problem where the incentive function is constrained to depend on $x-c(y)$ may yield direct implications for alternative cost allocations, but it is based on inefficient use of the information available to the principal. Alternatively, basing the incentive function on (x,y) will yield efficient contracting, and subsumes use of $(x,c(y))$ to determine compensation. However, the implications for the choice of cost allocation techniques may be indirect at best, since there is no way to disentangle the effects of y on the performance measure and the incentive function. The latter alternative has been chosen here, since the former should await a theory for accounting aggregation in agency relations.

In the analysis that follows, there are two individuals—a principal and an agent. Therefore, consideration of multi-agent issues such as responsibility accounting and common cost allocation cannot be made, but an analysis of the simpler two person setting seems to be a necessary step toward more complex settings.[4] In the model below, *allocation* is said to occur when the optimal incentive function is of the form $s(x,y)$ rather than $s(x)$. That is, the agent's compensation depends on the quantity of resource used in a non-trivial way. While this definition of allocation is consistent with Demski's [1981] observation that the benefits from cost allocation come from measuring the activity variable, it places some limits on the questions that can be addressed by the analysis, as noted in the previous paragraph. In particular, no evaluation of specific allocation alternatives can be made. However, two useful classifications of allocations can be defined. An allocation is defined to be *conventional* if, for all outcomes x, $y>y'$ implies that $s(x,y)<s(x,y')$. That is, for

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[2] One special case exists when $x=a+c(y)+\mu$ where a is the agent's action and μ is a random disturbance term with mean zero. In this situation, the statistic $x-c(y)$ is an unbiased estimate of the agent's action, a. However, it should be noted that $c(y)$ represents the *benefits* of the resource utilization, rather than its *costs*.

[3] This difficulty occurs in any agency analysis of accounting aggregation issues. For example, evaluating a "profit center" on the basis of (revenues − expenses) is never preferred to an evaluation based on (revenues, expenses).

[4] For a non-agency theory analysis of such problems, see Balachandran, Li, and Magee [1987].

any value of the outcome x, using more of the principal's resource results in lower compensation to the agent. An allocation is defined to be *unconventional* if it is not conventional, i.e., if there are some values of x for which the agent's compensation is an increasing function of the amount of resource used. The analysis below identifies circumstances under which unconventional allocations are efficient.

II. An Agency/Cost Allocation Model

This section develops an agency model that will be used to address some of the cost allocation issues identified above. The "productive outcome" x may take one of two values, x_1 or x_2, with $x_1 < x_2$. The probabilities of these outcomes depend on three factors: the agent's level of effort, a; the amount of the principal's resource used by the agent, y; and a parameter, θ, which determines the effect of y on the outcome probabilities (a and y are chosen from the nonnegative real numbers). The probability of outcome x_1, $\phi(x_1 | a,y,\theta)$, is decreasing and convex in a and $\theta \bullet y$. For the simple model developed here, θ may take on two values θ_1 and θ_2, with $0 \leq \theta_1 < \theta_2$, and $\phi(\theta_k)$ denotes the probability of θ_k occurring. While both the principal and the agent can observe the values of x and y, only the agent can observe the values of a and θ. The principal's preferences are reflected in a utility $G(x - C(y) - s(x,y))$ defined over the net monetary outcome, while the agent's preferences are additively separable in compensation and effort and are reflected in the function $U(s(x,y)) - V(a)$.[5] The principal's problem involves the choice of the agent's action (a_k, y_k) for each θ_k, and a compensation function $s(x,y)$ which will motivate the agent to make these decisions. It is assumed that the agent's effort choice problems yield unique interior solutions ($a_k \geq 0$ and $\alpha_k \geq 0$; $k=1,2$), so that the argmax conditions in (3) and (4) below can be replaced by first-order conditions in subsequent analysis.

$$\max_{\substack{a_1,a_2,y_1,\\ y_2,s(x,y)}} \left\{ \sum_{k=1}^{2} \phi(\theta_k) \bullet \left[\sum_{j=1}^{2} G(x_j - C(y_k) - s(x_j,y_k)) \bullet \phi(x_j | a_k,y_k,\theta_k) \right] \right\} \qquad (1)$$

subject to:

$$\sum_{k=1}^{2} \phi(\theta_k) \bullet \left[\sum_{j=1}^{2} U(s(x_j,y_k)) \bullet \phi(x_j | a_k,y_k,\theta_k) - V(a_k) \right] \geq U \qquad (2)$$

$$a_k \in \underset{a \in A}{\operatorname{argmax}} \left\{ \sum_{j=1}^{2} U(s(x_j,y_k)) \bullet \phi(x_j | a,y_k,\theta_k) - V(a) \right\} \quad \text{for } k=1,2 \qquad (3)$$

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[5] The functions satisfy the following conditions: $G'(\bullet)>0$, $G''(\bullet), \leq 0$, $U'(\bullet)>0$, $U''(\bullet)<0$, $V'(\bullet)\geq 0$, $V''(\bullet)>0$. That is, the principal is (weakly) risk averse, while the agent is (strictly) risk averse and increasingly effort averse.

$$\alpha_k \in \underset{a \in \mathrm{A}}{\operatorname{argmax}} \left\{ \sum_{j=1}^{2} U(s(x_j, y_m)) \bullet \phi(x_j \mid a, y_m, \theta_k) - V(a) \right\} \quad \text{for } k=1,2; \; m=1,2; \; m \neq k \qquad (4)$$

$$\sum_{j=1}^{2} U(s(x_j, y_k)) \bullet \phi(x_j \mid a_k, y_k, \theta_k) - V(a_k) \geq \sum_{j=1}^{2} U(s(x_j, y_m)) \bullet \phi(x_j \mid \alpha_k, y_m, \theta_k) - V(\alpha_k) \quad \text{for } k=1,2; \; m=1,2; \; m \neq k \qquad (5)$$

The constraints (2)-(5) in the above problem reflect the limits placed on the principal by the agent's decision making. Constraint (2) requires that the agent's expected utility must be greater than U, the amount that the agent could achieve in alternative employment. In this constraint, it is asssumed that the agent agrees to be employed by the principal prior to observing the value of θ. Constraints (3) and (4) reflect the agent's effort level decision under two different situations. In (3), the agent chooses action a_k to maximize his or her expected utility under the assumption that he or she chooses resource utilization y_k when θ_k occurs, i.e., when the agent conforms to the principal's plan of resource utilization. In constraint (4), the effort choice α_k maximizes the agent's expected utility when he or she does not conform to the principal's resource utilization plans. For instance, α_1 is the effort level chosen when θ_1 occurs and the agent chooses resource level y_2. Constraint (5) reflects the principal's management of the agent's choice of resource utilization levels by ensuring that the agent will choose y_k when θ_k occurs.

In effect, this last constraint reflects a "revelation" of the value of θ observed by the agent since the constraints insure that the agent "reports" the value of θ truthfully by choosing the level of utilization which is observable by the principal (assuming $y_1 \neq y_2$). The results in Myerson [1982] and Harris and Townsend [1981] imply that this constraint is not costly to the agency, in that any payoffs achievable without the constraint are also achievable with the constraint. However, the revelation results do not imply that constraint (5) is not binding on the principal, as shown in a later example. That is, the principal may not be as well off as if he or she could observe the outcome θ_k directly, because the agent's incentive function must be set so as to motivate revelation of the agent's information. The use of resource level y in the agent's incentive function may provide a means by which the agent can communicate information concerning the payoff from using the resource.[6]

The first result shows the necessity of using the resource utilization, y, in determining the agent's compensation.

> *Proposition 1*: If $\theta_1 > 0$, and if the solution to the principal's problem in (1)-(5) has (i) interior effort solutions for a_1 and a_2, and (ii) resource utilization which depends on θ (i.e., $y_1 \neq y_2$), then it cannot be the case that $s(x,y_1) = s(x,y_2) = s(x)$ for all x.

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[6] In similar models, Harris, Kriebel, and Raviv [1982] use the agent's choice of transfer price as a means to elicit information, and Antle and Eppen [1985] used the agent's choice of an output target to allocate capital. It should be noted that, with y observable, delegation of resource utilization in this model is equivalent to one in which the principal chooses y after receiving a report on θ from the agent.

The proof, by contradiction, is straightforward. Interior effort requires $s(x_2)>s(x_1)$, so the agent's expected utility is strictly increasing in y for any values of a and θ. Therefore, the agent would always choose $y=\max\{y_1,y_2\}$, implying that the principal cannot implement a policy where $y_1 \neq y_2$. The intuition behind this result is clear: if $y_1<y_2$, then the agent will always use y_2 units of resource unless there is some kind of "charge" for the additional units reflected in the incentive function.

But the form of this "charge" is difficult to discern from the problem in (1)-(5). Assuming the principal is risk-neutral and that the agent's effort choices can be described by the first order conditions, the Lagrangian of problem (1)-(5) can be formed as in expression (A1) in the Appendix. For simplicity, $s(x_i,y_j)$ is written as s_{ij}, $\phi(x_1|a,y,\theta)$ is written as $\phi(a,\theta\bullet y)$, and $C(y)$ is assumed to be $\xi\bullet y$ in the following analysis. The multipliers of the Lagrangian in (A1) are λ for the minimum expected utility constraint, μ_i for the agent's choice of a_i, γ_i for the agent's choice of α_i, and ω_i for the truth-telling constraint after observing θ_i. Before developing the conditions for the optimal incentive contract, some results for the multipliers are presented. Throughout the analysis, it is assumed that $s_{2j}>s_{1j}$ and $x_2-s_{2j}>x_1-s_{1j}$ for $j=1,2$ (see Grossman and Hart [1983]).

Proposition 2: For the problem represented in (A1), the following is true about the multipliers.

(i) $\gamma_1=\gamma_2=0$
(ii) $\mu_1>0, \mu_2>0$
(iii) $\omega_1\geq 0, \omega_2\geq 0$

Proof: (see the Appendix)

These conditions imply that the agent's choice constraints for α_1 and α_2 are not costly to the principal at the margin. This result is not surprising because the agent never actually takes actions α_1 or α_2. On the other hand, the constraints for a_1 and a_2 are costly to the principal. Another observation has to do with the principal's choice of y_1 and y_2. When θ_j occurs, the marginal net benefit of y_j to the principal is $(-\xi+[x_1-s_{1j}-x_2+s_{2j}]\bullet\phi_y(a_j,\phi_j\bullet y_j))$, so the value of y_j that sets this equal to zero maximizes the (unconstrained) benefits to the principal. However, the principal's choice of y_j must take into account its effect on the agent's expected utility, effort choice, and truth-telling constraints. In general, a researcher would find that the resource utilization would not maximize the expected payoff to the principal holding s_{1j}, s_{2j}, and a_j constant.

The principal's Lagrangian can be differentiated with respect to the incentive scheme to find the following relations:

$$\begin{aligned}\frac{1}{U'(s_{11})} &= \lambda+\mu_1\,\frac{\phi_a(a_1,\theta_1\bullet y_1)}{\phi(\theta_1)\phi(a_1,\theta_1\bullet y_1)}\\ &\quad+\omega_1\,\frac{1}{\phi(\theta_1)}\\ &\quad-\omega_2\,\frac{\phi(\alpha_2,\theta_2\bullet y_1)}{\phi(\theta_1)\phi(a_1,\theta_1\bullet y_1)} \qquad (6)\end{aligned}$$

$$\begin{aligned}\frac{1}{U'(s_{21})} &= \lambda-\mu_1\,\frac{\phi_a(a_1,\theta_1\bullet y_1)}{\phi(\theta_1)[1-\phi(a_1,\theta_1\bullet y_1)]}\\ &\quad+\omega_1\,\frac{1}{\phi(\theta_1)}\\ &\quad-\omega_2\,\frac{[1-\phi(\alpha_2,\theta_2\bullet y_1)]}{\phi(\theta_1)[1-\phi(a_1,\theta_1\bullet y_1)]} \qquad (7)\end{aligned}$$

$$\frac{1}{U'(s_{12})}=\lambda+\mu_2\,\frac{\phi_a(a_2,\theta_2\cdot y_2)}{\phi(\theta_2)\phi(a_2,\theta_2\cdot y_2)}-\omega_1\,\frac{\phi(\alpha_1,\theta_1\cdot y_2)}{\phi(\theta_2)\phi(a_2,\theta_2\cdot y_2)}+\omega_2\,\frac{1}{\phi(\theta_2)} \qquad (8)$$

$$\frac{1}{U'(s_{22})}=\lambda-\mu_2\,\frac{\phi_a(a_2,\theta_2\cdot y_2)}{\phi(\theta_2)[1-\phi(a_2,\theta_2\cdot y_2)]}-\omega_1\,\frac{[1-\phi(\alpha_1,\theta_1\cdot y_2)]}{\phi(\theta_2)[1-\phi(a_2,\theta_2\cdot y_2)]}+\omega_2\,\frac{1}{\phi(\theta_2)} \qquad (9)$$

While these expressions are not easily compared, there is a "cost allocation" interpretation for the terms involving ω_1. It seems plausible that some solutions to the principal's problem will have the agent pick a higher y when θ_2 occurs. In those cases, it is likely that $\omega_1>0$ (and $\omega_2=0$) because the principal will have to make sure that the agent will not choose the higher resource level when θ_1 occurs. Terms involving ω_1 are positive for (6) and (7) and negative for (8) and (9) implying that the marginal effect of influencing the agent's resource decision is to increase s_{11} and s_{21} relative to s_{12} and s_{22}.[7] This behavior is what would be expected with a conventional cost allocation.

The expressions in (6)–(9) also imply that there are other factors that influence the impact of resource utilization on the agent's incentives. In particular, an interaction between resource utilization and the agent's effort can affect terms involving μ_1 and μ_2. In addition, the levels of θ and y can affect the marginal informativeness of x about the agent's effort. The next section explores two examples to find unconventional allocations.

III. Two Examples

While the agent uses the resource utilization decision to communicate the effectiveness of the resource, this communication may also have implications for the agent's effort choice. For example, suppose that a is selling effort, y is advertising, and θ is a parameter reflecting market acceptance. There often may be a synergy, or complementarity, between selling effort and advertising, so that a more favorable market acceptance parameter would cause the organization to desire higher advertising *and* higher sales effort. On the other hand, the agent may have responsibility for a project where the central resource (e.g., capital) and the agent's effort may be viewed as substitutes, i.e., where the marginal benefits of agent effort are decreasing in $\theta\cdot y$. In this setting, a higher value of θ could lead the organization to desire higher resource utilization and lower agent effort. In both cases, the purpose of the incentive scheme is to orchestrate the agent's choice of effort and resource utilization.

> *Proposition 3*: The cost allocations reflected in optimal incentive schemes, solving the principal's problem in (1)–(5), are not limited to conventional allocations.

The proof is via two examples. The parameters and functions used in the examples and their solutions are given in Table 1. In both examples, the principal is assumed to be risk-neutral and the

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[7] A symmetric story holds if $y_2<y_1$, $\omega_2>0$, and $\omega_1=0$.

TABLE 1
EXAMPLES OF UNCONVENTIONAL ALLOCATIONS

	Example 1 *Effort and Resource are Substitutes*	*Example 2* *Effort and Resource are Complements*
Principal's Utility	$x_i - 10\cdot y_j - s_{ij}$	$x_i - 30\cdot y_j - s_{ij}$
Agent's Utility	$2\sqrt{s_{ij}} - .1\cdot a_j^2$	$2\sqrt{s_{ij}} - .2\cdot a_j^3$
θ_1	0.5	0.00
θ_2	1.0	0.15
$\phi(\theta_1)$	0.5	0.5
$\phi(\theta_2)$	0.5	0.5
x_1	400	400
x_2	1000	1000
U	50	50
$\phi(x_1 \mid a,y,\theta)$	$\dfrac{1}{4/3 + a + \theta\cdot y}$	$\dfrac{1}{4/3 + a\cdot\theta\cdot y}$
a_1	2.897	0.00
y_1	1.302	0.00
s_{21}	712.08	625.00
s_{11}	391.33	625.00
a_2	0.837	0.445
y_2	5.203	0.288
s_{22}	665.71	721.90
s_{12}	451.49	593.08
λ	25.227	25.004
μ_1	13.397	0.000
μ_2	14.454	10.270
ω_1	0.022	0.000
ω_2	0.000	0.002
Unconventional Aspect*	$s_{11} < s_{12}$	$s_{21} < s_{22}$

* s_{ij} is the compensation paid when x_i occurs and the agent uses resource level y_j. An allocation is unconventional when the agent is paid more for using more resource given the x outcome. That is, the allocation is unconventional if $s_{11} < s_{12}$ or if $s_{21} < s_{22}$.

agent has a utility function for money that is

$$U(s) = 2\cdot\sqrt{s}$$

Solutions were found by numerical approximation. That is, the conditions for a solution to (A1) were found and solved.[8]

Example 1 considers the substitution case described above. When θ is low, the principal prefers lower resource utilization and higher agent effort. To motivate this action strategy, the efficient menu of contracts displays an *unconventional* allocation. When x_2 occurs, the use of more resource causes the agent's compensation to decrease, but the opposite is true when x_1 occurs. In

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[8] A microcomputer program called TK!Solver by Software Arts was used to solve the system of nonlinear equations. In general, TK!Solver considers two values, x and y, to be equal if the following inequality is true.

$$\frac{|x-y|}{\max(|x|,|y|)} \leq \text{Comparison Tolerance}$$

The comparison tolerance used in solving the two examples is 0.000001.

the example, if x_1 occurs and the agent has used 5.203 units of resource, he or she receives $451.49-391.33=$60.16 *more* than if only 1.302 units of resource had been used.[9] Certainly this behavior is not consistent with cost allocation techniques which have the property that more utilization always causes a performance measure decrease.

Example 2's solution exhibits the opposite behavior. The agent's effort and the resource are complements, so if $\theta_1=0$, neither effort nor the resource are effective in improving the probability distribution of x. When $\theta_2>0$ occurs, the agent provides effort and uses some resource, but when x_2 occurs, the efficient incentive function will pay the agent more if a higher level of resource was used. In this example, ω_2 is positive, indicating that it was necessary to provide incentives for the agent to use more y when θ_2 occurs instead of the more traditional case encouraging the use of less y when θ_1 occurs.

IV. IMPLICATIONS FOR COST ALLOCATION PROCEDURES

The preceding sections have presented some of the characteristics of efficient incentive contracts based on a productive outcome and the level of resource used by an agent.

Direct implications of these results for cost allocation procedures are difficult to determine, because the efficient contracts are not based on a summary performance statistic of the form $x-c(y)$, and it is difficult to separate the performance measurement implications from the form of the incentive function. Proposition 1 shows that, in general, some form of allocation (i.e., the use of y in determining the agent's incentive compensation) is required to foster efficient use of the resource, but implications for efficient allocation procedures proved difficult to develop.

In a survey of practice, Vancil [1979] reports that the cost of central administrative services are most commonly allocated to profit centers on the basis of (actual or estimated) usage or by a proration based on sales, costs, or assets. Horngren and Foster's [1987, p. 413] discussion of cost allocation "emphasizes the superiority of the cause-and-effect criterion when the purpose of cost allocation is related to resource allocation decisions or motivation." In the context of the agency problem considered here, the cause-and-effect relation is that the agent's choice of y causes the principal to incur a cost $C(y)$. Therefore, the allocation should be based on y alone, and increasing as y increases. On the other hand, an allocation based on ability-to-bear might take the agent's productive outcome into consideration, and the allocation might depend on both x and y.

If we assume that an incentive function based on a summary performance measure $x-c(\cdot)$ would be increasing in that measure, a cause-and-effect allocation would be a conventional one in the agency analysis above. However, we find in examples 1 and 2 that such an arrangement cannot approximate an efficient contract based on x and y. On the other hand, these contracts might be approximated by an allocation that depends on x as well as on y—a rather extreme form of ability-to-bear allocation or a type of conditional (on x) subsidization. In example 1, an agent who uses more units of resource appears to be "charged less" for the extra units (i.e., relative to compensation when fewer units are used) when the productive outcome is low than when the productive outcome is high, a result produced, in part, by risk-sharing considerations. The reverse happens in example 2, where the agent is "penalized" for using a higher level of resource and not producing a high outcome, and "rewarded" for achieving a high outcome with the higher resource level.

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[9] Risk aversion may explain the difference between the results found here and those reported in Harris, Kriebel, and Raviv [1982], where a transfer pricing scheme was a cost minimizing mechanism for internal resource allocation.

The conclusion of this analysis is that efficient cost allocation procedures must balance three factors. The first of these is the desire for efficient utilization (in the second-best sense) of the resource which is provided by the principal. No allocation will usually lead to usage of the resource to the point where marginal costs exceed marginal benefits. To this commonly perceived factor, two more must be added. The first is risk-sharing between the principal and agent. Although the agent is able to observe the efficiency of the principal's resource, he or she is not able to control that efficiency. Therefore, there is some "θ-risk" that the principal must manage, and if the agent is more risk-averse than the principal, the principal should bear as much of this risk as is consistent with effective motivation of the agent.

The last factor that must be considered in designing the cost allocation procedure is the set of decisions which the agent makes *in addition* to the resource utilization (e.g., effort), and the ways that these decisions are to be adapted to the environment that the agent observes and the resource level that is chosen. Should the same effort level be chosen regardless of the environment and resource utilization, or should it decline as y increases (as in example 1), or should it increase as y increases (as in example 2)? Specifically, if resource usage were the *only* decision made by the agent, there would be no need for cost allocation. Therefore, the focus of cost allocation analysis should include *all* decisions delegated to a manager, rather than focusing on specific decisions which cause costs to be incurred by a central management.

V. SUMMARY

The analysis above provides some insights into the implications of agency theory for an important accounting topic: the allocation of the cost of central resources used by the agent. At the most basic level, allocation can be defined as using the agent's choice of resource utilization in evaluating his or her performance and in determining his or her compensation—a practice that makes sense only when the agent possesses private information about the environment in which the resource will be used. The objective of the allocation is to enable the principal to orchestrate the agent's choice of effort and resource level, taking advantage of the agent's superior information regarding the effectiveness of the principal's resource. The results presented conditions under which allocation is required for the efficient solution of the principal's problem, but it is difficult to say more about the specific form that that allocation might take. It is not only possible, but sometimes efficient, for the optimal contract to have properties that do not reflect those of most cost allocation techniques. The conclusion here is similar to Demski's [1973] result that it is impossible to rank the desirability of accounting procedures on the characteristics of the procedures alone.

A number of questions remain to be addressed by future research. Does the optimal allocation scheme change if the agent must expend effort to observe θ [Lambert, 1986]? Or, the allocation of fixed central costs to the agent (or agents) could be explored if the agent(s) supplied forecasts to the principal that were used in determining a cost structure for the central resource. However, a critical issue in the analysis of accounting measurement within an agency theory context is the question of aggregation of accounting measures into a summary measure such as profit or contribution margin. Identification of conditions under which aggregated measures are efficient in solving the agency problem is necessary before analyses such as the current one can address the desirability of specific accounting allocation procedures.

APPENDIX

The Lagrangian for the principal's problem in (1)-(5) is the following:

$$\begin{aligned}
\mathcal{L} \equiv {} & \phi(\theta_1)\{[x_1-\xi\bullet y_1-s_{11}]\bullet\phi(a_1,\theta_1\bullet y_1)+[x_2-\xi\bullet y_1-s_{21}](1-\phi(a_1,\theta_1\bullet y_1))\}\\
& +\phi(\theta_2)\{[x_1-\xi\bullet y_2-s_{12}]\bullet\phi(a_2,\theta_2\bullet y_2)+[x_2-\xi\bullet y_2-s_{22}](1-\phi(a_2,\theta_2\bullet y_2))\}\\
& +\lambda\{\phi(\theta_1)[U(s_{21})-(U(s_{21})-U(s_{11}))\bullet\phi(a_1,\theta_1\bullet y_1)-V(a_1)]\\
& \quad +\phi(\theta_2)[U(s_{22})-(U(s_{22})-U(s_{12}))\bullet\phi(a_2,\theta_2\bullet y_2)-V(a_2)]-U\}\\
& \quad +\mu_1\{(U(s_{11})-U(s_{21}))\bullet\phi_a(a_1,\phi_1\bullet y_1)-V'(a_1)\}\\
& \quad +\mu_2\{(U(s_{12})-U(s_{22}))\bullet\phi_a(a_2,\phi_2\bullet y_2)-V'(a_2)\}\\
& \quad +\gamma_1\{(U(s_{12})-U(s_{22}))\bullet\phi_a(\alpha_1,\phi_1\bullet y_2)-V'(\alpha_1)\}\\
& \quad +\gamma_2\{(U(s_{11})-U(s_{21}))\bullet\phi_a(\alpha_2,\phi_2\bullet y_1)-V'(\alpha_2)\}\\
& \quad +\omega_1\{[U(s_{21})-(U(s_{21})-U(s_{11}))\bullet\phi(a_1,\phi_1\bullet y_1)-V(a_1)]\\
& \qquad -[U(s_{22})-(U(s_{22})-U(s_{12}))\bullet\phi(\alpha_1,\phi_1\bullet y_2)-V(\alpha_1)]\}\\
& \quad +\omega_2\{[U(s_{22})-(U(s_{22})-U(s_{12}))\bullet\phi(a_2,\phi_2\bullet y_2)-V(a_2)]\\
& \qquad -[U(s_{21})-(U(s_{21})-U(s_{11}))\bullet\phi(\alpha_2,\phi_2\bullet y_1)-V(\alpha_2)]\}
\end{aligned} \tag{A1}$$

Proof of Proposition 2

To show that $\gamma_1=0$, differentiate the Lagrangian in (A1) by α_1. The resulting expression is:

$$\begin{aligned}
& \gamma_1\{(U(s_{12})-U(s_{22}))\bullet\phi_{aa}(\alpha_1,\theta_1\bullet y_2)-V''(\alpha_1)\}\\
& \quad +\omega_1\{(U(s_{22})-U(s_{12}))\phi_a(\alpha_1,\theta_1\bullet y_2)+V'(\alpha_1)\}=0.
\end{aligned}$$

The second term is ω_1 times the agent's first-order condition for α_1, so it equals zero. The first term is γ_1 times the agent's second-order condition for α_1. Therefore, this expression can hold only if $\gamma_1=0$. ($\gamma_2=0$ by an identical analysis.)

Results for μ_1 and μ_2 can be found by differentiating the Lagrangian with respect to a_1 and a_2, respectively. For a_1, the expression is:

$$\begin{aligned}
& \phi(\theta_1)\{[x_1-s_{11}-x_2+s_{21}]\phi_a(a_1,\theta_1\bullet y_1)\}\\
& \quad +\lambda\{\phi(\theta_1)[-(U(s_{21})-U(s_{11}))\bullet\phi_a(a_1,\theta_1\bullet y_1)-V'(a_1)]\}
\end{aligned}$$

$$+\mu_1\{(U(s_{11})-U(s_{21}))\phi_{aa}(a_1,\theta_1\bullet y_1)-V''(a_1)\}$$
$$+\omega_1\{-(U(s_{21})-U(s_{11}))\bullet\phi_a(a_1,\theta_1\bullet y_1)-V'(a_1)\}=0.$$

The second and fourth terms of this expression involve the agent's first-order condition for a_1 and must equal zero. The first term is positive as long as $x_2-s_{21}>x_1-s_{11}$, and the third term can be negative only if $\mu_1>0$. The argument for $\mu_2>0$ is identical.

The non-negativity of the multipliers, ω_1 and ω_2, on the truth-telling constraints derives from the fact that these are inequality constraints. See Zangwill [1969, Theorem 2.14], for a proof.

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An Analysis of Auditor Litigation and Audit Service Quality

Zoe-Vonna Palmrose

ABSTRACT: This study compares litigation activities of independent auditors to assess litigation as a means for making quality distinctions among auditors. The study provides a framework suggesting auditors with relatively low (high) litigation activity represent higher (lower) quality suppliers. The empirical analysis examines a sample of legal cases ($n=472$) and resolutions for these cases (if available, $n=183$). The cases involve audit-related litigation against both Big Eight and large non-Big Eight firms during 1960–1985. The results indicate that non-Big Eight firms as a group have higher litigation activity than Big Eight firms. This result is consistent with existing research supporting the Big Eight as quality-differentiated auditors. Comparisons among Big Eight firms reveal some significant differences. However, identification of particular Big Eight firms as low (high) litigation activity auditors appears sensitive to the type of analysis.

THIS study compares litigation activities among the largest U.S. independent audit firms. Litigation against auditors typically involves a process, from initial discovery of potentially false or misleading financial statements, to filing of lawsuits, and eventual resolution of such suits. In investigating differences in litigation among auditors, the study utilizes data on both litigation occurrences and resolutions.

The primary objective of the comparisons is to assess litigation as a means for making quality distinctions among independent audit firms. Previous empirical research on auditor litigation (Kellogg [1984]; Palmrose [1987]; and St. Pierre and Anderson [1984])[1] and on audit quality (Francis and Simon [1987]; Nichols and Smith [1983]; Palmrose

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Zoe-Vonna Palmrose is Assistant Professor at the School of Business Administration, University of California at Berkeley.

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[1986]; and Shockley and Holt [1983]) has not provided evidence on this issue. However, the potential usefulness of litigation in judging audit quality has been recognized (Dopuch and Simunic [1982]; Simunic and Stein [1987]).

An inverse expected relation between auditor quality and litigation is developed. Briefly, the value of external audits derives from users' expectations auditors will detect and correct/reveal any material omissions or misstatements of financial information. Failure to do so, termed an audit failure,[2] typically results in litigation when clients/users incur losses in conjunction with materially false or misleading financial information. This suggests that (under *ceteris paribus* conditions) users can view auditors with relatively low (high) litigation activity as higher (lower) quality suppliers.

This study examines auditor litigation to determine if firms differ, and if so, which ones represent low (high) activity firms. The evidence constitutes a first step in assessing the usefulness of litigation in making quality distinctions among independent audit firms. In examining auditors' litigation activities, the study also considers non-qualitative factors that may influence auditors' litigation.

As a secondary objective, the study provides unique descriptive data on litigation activities for each Big Eight firm and a group of the largest non-Big Eight firms. A sample of 472 cases relating to audits performed from 1960 through 1985 serves as a basis for analyses.

The remainder of the study is organized as follows. The next section develops a framework using litigation to make quality distinctions among auditors. The remaining sections describe sample selection criteria; discuss analyses of litigation occurrences and litigation resolutions, and concluding remarks.

I. CONCEPTUAL FRAMEWORK

This section develops possible associations among audit quality, audit failures, and litigation. While a three-part characterization is somewhat complicated, it is necessitated by users' inability to directly observe either audit quality (see DeAngelo [1981]; Palmrose [1986]) or audit failures. In essence, litigation helps identify audit failures, so that litigation potentially represents the most observable component of the three. However, litigation is not perfectly associated with audit quality and this section discusses considerations that may affect the association. A definition of audit quality serves as a starting point for these developments.

Audit "quality" is defined in terms of the level of assurances—the probability financial statements contain no material omissions or misstatements.[3] Higher levels of assurances correspond to higher

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[1] Kellogg [1984] analyzed associations between stock prices and accounting announcements for 10b-5 class action suits; Palmrose [1987] examined the role of business failures and management fraud in auditor litigation; and St. Pierre and Anderson [1984] investigated factors associated with litigation against public accountants. The Kellogg and St. Pierre and Anderson studies relied on smaller sample sizes ($n=56$ and $n=129$, respectively) and did not limit sample observations to audit-related lawsuits or lawsuits with auditors as one of the defendants. None of the studies presented comparisons of individual audit firm litigation.

[2] Here, audit failures include financial statements with material omissions/misstatements whether or not auditors have obtained adequate audit evidence.

[3] This definition is consistent with both DeAngelo's [1981] definition of audit quality and the professional literature that describes audit quality in terms of audit risk, with higher quality services reflecting lower audit risk. Audit risk is defined as the risk that "the auditor may unknowingly fail to appropriately modify his opinion on financial statements that are materially mis-

quality services. An important implication of this definition is that audit failures (financial statements with material omissions/misstatements) become less likely with higher quality services.

In discussing litigation as a consequence of audit failures, we assume that litigation is costly and that litigation costs provide additional incentives to higher quality auditors for avoiding audit failures. Auditors face unlimited liability in connection with civil actions against them which accounts, in part, for litigation costs.[4] However, other costs accompany litigation, including costs associated with professional and regulatory (e.g., SEC) sanctions and with reduced reputations for quality of service. While insurance may help reduce impacts from civil penalties, insurance does not cover criminal actions against individuals, professional and regulatory sanctions against firms and individuals, or losses from reputation diminishment.[5] The latter becomes particularly relevant to high quality auditors, since they have more to lose [DeAngelo, 1981]. Thus, high quality auditors, with reputations for detecting and correcting/revealing material omissions or misstatements, have greater incentives to minimize audit failures to maintain this reputation.

Figure 1 shows the presumed links between client/user losses and audit litigation outcomes. As denoted in Figure 1, when clients and/or users (such as creditors or investors) incur losses, these losses may or may not entail material omissions/misstatements of financial statements, i.e., audit failures.[6] An example of circumstances when user losses occur without audit failures would be client bankruptcies not involving false or misleading financial statements.[7] As illustrated in Figure 1, litigation helps reveal which loss situations also involve audit failures. Lawsuits against auditors (or threatened lawsuits) represent the most likely (probable) action with an audit failure. Furthermore, payments by auditors to plaintiffs represent the most likely outcome from audit failure litigation. Auditor payments include both court imposed judgments and out of court settlements. Out of court settlements may come from actual or merely threatened lawsuits. Conversely, when client/user losses occur without audit failures, the most likely outcome is no litigation against auditors and no payments by auditors.

These two links reflecting most likely actions and outcomes, audit failure-litigation-payments versus no audit failure-no litigation-no payments, suggest both litigation occurrences and resolutions should be associated with audit failures. However, each of these measures have ambiguities of interpretation that require some discussion.

First, Figure 1 recognizes the possibility clients/users may undertake legal actions against auditors when no audit failure exists. Auditors as persons having

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stated" (AICPA (SAS No. 47) [1985]). Because auditing is costly, a positive, albeit "low" level of audit risk is allowed under auditing standards. Thus, some "audit failures" would be expected for even high quality auditors.

[4] This study assumes "keeping auditors honest" rather than insuring clients/users against losses serves as the role of litigation in the audit services market.

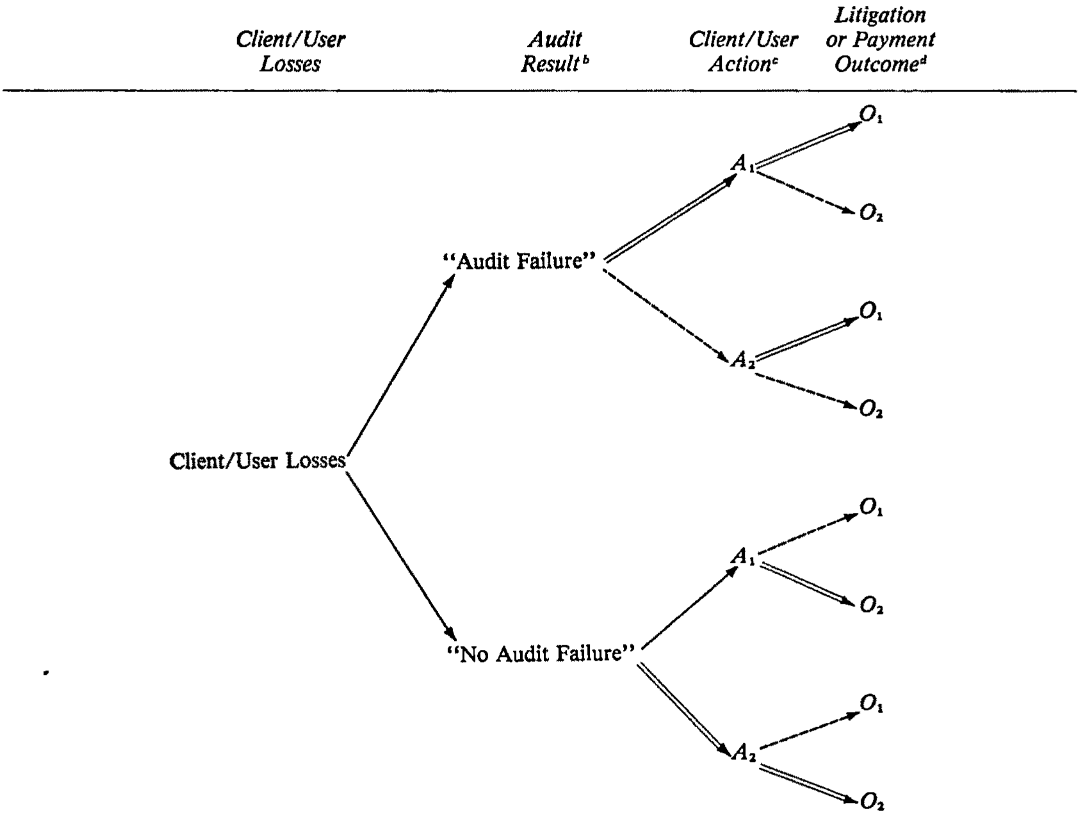
[5] In addition, insurance costs partly depend on audit firms' litigation experience. Other litigation-related costs that larger firms usually absorb include: legal fees, staff costs associated with case preparation and defense, settlement payments below insurance deductibles, and settlements/judgments in excess of insurance policy limits.

[6] St. Pierre and Anderson [1984] suggest losses as a major factor in initiating searches for audit failures. Plaintiffs must allege losses to meet one requirement for filing lawsuits.

[7] Palmrose [1987] found nearly 80 percent of 458 companies declaring bankruptcy (identified via the *WSJ Index* [1970–1985]), that also used auditors listed in Table 1, had no indication of litigation against the auditors.

FIGURE 1

LIKELIHOOD OF AUDITOR LITIGATION OCCURRENCES/OUTCOMES GIVEN CLIENT/USER LOSSES[a]



[a] ⇒ Probable (Most Likely)
→ Possible
⇢ Remote

[b] "Audit Failure" includes material misstatements whether or not the auditor has obtained adequate audit evidence.

[c] A_1 Lawsuit Against Auditor
A_2 No Lawsuit Against Auditor

[d] O_1 Auditor Payments (Including Out-Of-Court Settlements, Court Imposed Judgments, and Payments to Avoid Litigation)
O_2 No Auditor Payments (Including Court Dismissals of Claims Against Auditors)

"deep pockets" characterizes one motivation for such suits. Since these cases allege audit failures, users can find it difficult to distinguish these cases from audit failures at initiation of lawsuits against auditors. In addition, estimates of audit failure rates based on litigation occurrences would be overstated because of these cases.

To some extent, litigation outcome data help resolve this difficulty. Assuming the litigation process (including discovery and court hearings) reveals merits of claims, lawsuits without audit failures would most likely result in court dismissals of claims against auditors and/or out of court settlements without any payments by auditors. Empirically this means litigation occurrences as a measure of audit quality might be reduced by cases with lawsuit dismissals/no auditor payments when comparing litigation among auditors, as discussed in section IV.

However, a second issue arises when utilizing resolution data and assuming auditor payments represent remote outcomes from litigation not involving audit failures. In settling litigation out of court, auditors frequently state that payments were made to avoid expenses of protracted litigation and such payments do not indicate an inadequate audit. Although auditors do not necessarily confine these statements to situations involving small (token) payments, relatively small payments may signify circumstances in which users view such statements as credible.[8] While the study classifies cases with any auditor payments as meritorious and cases without auditor payments as non-meritorious, additional analyses consider payment size, in part, to provide insight into this issue (see section IV).

A third issue requiring discussion relates to auditors negotiating settlement payments to avoid litigation in the face of audit failures. As shown in Figure 1, in these instances payments by auditors describe the most likely outcome (audit failure but no lawsuit against auditor). In selecting the sample, cases of auditor payments without litigation are included in both litigation occurrences and resolutions (as meritorious cases) consistent with an underlying assumption that these cases represent audit failures (see section II).

Finally, resolution data entail weaknesses not necessarily evident in Figure 1. One of the foremost problems with users relying on resolution data in assessing audit quality relates to long time horizons, including appeals, from inception of litigation to full and complete case resolution. Settlements several (or many) years after initiation of suits may be too delayed to allow meaningful revisions in users' assessments of audit quality. Other problems with resolution data involve the degree of expertise attributed to the court process in correctly specifying cases (as audit failure/not audit failure) and reflecting this correct specification in litigation outcomes. For example, favorable resolutions for auditors based on an inability of plaintiffs to meet class-action requirements might still involve audit failures. Furthermore, there may be (un)favorable resolutions because of changing interpretations of laws, jurisdictional differences, or randomness of juries. All of these considerations may reduce associations among audit quality, audit failures, and litigation outcomes.

Thus, this framework proposes an inverse relation between audit quality and litigation rates. Briefly, with higher quality services, audit failures become less likely. When audit failures occur in conjunction with client/user losses, clients/users file lawsuits against independent auditors. Accepting both audit failures as less likely with higher quality services and litigation as a primary consequence of audit failures, yields a basic proposition that higher quality auditors have relatively lower litigation rates than lower quality auditors. Because litigation helps reveal audit failures, this framework suggests users can observe differences in litigation occurrences among auditors and infer relative audit quality.

Figure 1 also shows that litigation against independent auditors can occur without audit failures. Therefore, making inferences regarding auditor quality using observed differences in litigation requires considering merits of plaintiffs' claims. If non-meritorious lawsuits (i.e., those not involving audit failures) get resolved favorably for auditors (auditor dismissals/no auditor payments), while audit failures that involve inadequate audit evidence require payments by auditors, then resolution data can supplement litigation occurrence data in identifying audit failures and assessing auditor quality. Note, the framework also includes as audit failures instances of auditor payments to avoid litigation.

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[8] To protect reputations, some auditors may avoid even token payments to settle non-meritorious suits. Thus, users may perceive even token payments as admissions of audit failures.

In summary, the framework suggests the potential usefulness of litigation rates to distinguish among auditors on the basis of quality. To provide preliminary insights into this potential, we examine data on litigation occurrences and resolutions for differences among auditors. The next section describes selection of the sample.

II. SAMPLE SELECTION

This section summarizes criteria used to acquire a sample of legal cases involving independent auditors. Cases encompass audit services[9] rendered for the 26-year-period from 1960 through 1985. This time period includes the major concentration of lawsuits against independent auditors.[10] The (approximately) 15 largest audit firms were selected for the study. Table 1 lists and classifies firms as Big Eight and non-Big Eight. While some firms have international operations, the sample is confined to cases involving audits in the U.S. market. During 1960–1985, many audit firms engaged in mergers and an attempt was made to include cases for primary components of present firms. Table 1 notes these components.

Firms in Table 1 comprise a major portion of the audit services market. For example, these firms audit over 90 percent of public companies (see *Who Audits America* (*WAA*) [1984]). In addition, limiting the sample to large firms recognizes that audit firms may differ in their attractiveness as litigation targets. As previously discussed, suits against auditors may be filed without an audit failure, partly because auditors represent potential "deep pockets." In this regard, larger audit firms may present more desirable targets than smaller firms because of greater resources and insurance coverage. However, the Big Eight and largest non-Big Eight firms appear relatively homogeneous on this dimension.[11]

Cases were identified using the following sources:

1. *The Wall Street Journal Index* (*WSJ*) listing for each firm in Table 1 [January 1960–November 1986].
2. Litigation news in the *Public Accounting Report* (*PAR*) [January 1978 (first issue)–November 1986].
3. Litigation news in the *International Accounting Bulletin* (*IAB*) [July 1983 (first issue)–November 1986].
4. Securities and Exchange Commission (SEC) Accounting Series Re-

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[9] While nearly all cases involve audit services, several cases entail less than a full scope audit (e.g., review or compilation services). By focusing on audit services supplied to specific clients, the study excludes a variety of litigation against public accounting firms (e.g., litigation regarding employment practices and employee activities, anti-competitive practices, and non-audit services).

[10] For example, *Forbes* noted "as recently as 1962 there were perhaps two lawsuits pending against major CPA firms" (Minard and Wilson [1980], p. 14).

[11] There are other possible dimensions to the attractiveness of audit firms as litigation targets. For example, Kinney [forthcoming] models the probability of suits against auditors as follows:

$P(\text{suit}) = f$ (actual user losses, amount of misstatement in audited financial statements, reputation of auditor for audit quality (i.e., low detection risk), auditor legal posture, and user's and client's costs to sue).

Audit firm litigation posture is discussed in section IV.

TABLE 1

AUDIT FIRMS INCLUDED IN THE SAMPLE

Big Eight	
(AA)	Arthur Andersen & Co.
(AY)	Arthur Young & Co.
(CL)	Coopers & Lybrand (Lybrand, Ross Bros. & Montgomery)
(DHS)	Deloitte Haskins & Sells (Haskins & Sells)
(EW)	Ernst & Whinney (Ernst and Ernst)
(PMM)	Peat, Marwick, Mitchell & Co.
(PW)	Price Waterhouse
(TR)	Touche Ross & Co. (Touche, Ross, Bailey & Smart)
Non-Big Eight	
(AG)	Grant Thornton
	Alexander Grant & Company
	Fox & Company
	Including: Elmer Fox & Co.
	Westheimer, Fine, Berger & Co.
	Elmer Fox, Westheimer & Co.
(MH)	KMG Main Hurdman
	Including: Main Lafrentz & Co.
	Hurdman & Cranstoun
	Hurdman & Cranstoun, Penney
	Main, Hurdman & Cranstoun
	L. H. Penney & Co.
	John F. Forbes & Co.
(LH)	Laventhol & Horwath (Laventhol, Krekstein, Horwath, and Horwath)
(JKL)	J. K. Lasser & Co.[a]
(SDL)	S. D. Leidesdorf & Co.[b]
(McHP)	McGladrey, Hendrickson, Pullen & Co.
	Including: McGladrey Hendrickson & Co.
	Broeker, Hendrickson & Co.
	McGladrey, Hansen, Dunn & Co.
	A. M. Pullen & Co.
(PKF)	Pannell Kerr Forster (Harris Kerr Forster)
(SS)	Seidman & Seidman
	Including: Wolfson, Weiner, Ratoff & Lapin

[a] Included as non-Big Eight prior to merger with TR.

[b] Included as non-Big Eight prior to merger with EW.

leases (ASR) and Accounting and Auditing Enforcement Releases (AAER).

(5) Cases reported on Mead Data's LEXIS system in the general federal file [January 1960–April 1986] where firms in Table 1 were named as either plaintiff/defendant or appellee/appellant.

(6) Cases reported on Mead Data's LEXIS system in the California and New York state files [January 1975–April 1986] where firms in Table 1 were named as either plaintiff/defendant or appellee/appellant.

(7) Cases disclosed in Mead Data's NAARS system in files for general annual reports and proxy statements [December 1985].

(8) Lawsuits mentioned in prior studies of accountants' liability/litigation (e.g., Kellogg [1984]; St. Pierre and Anderson [1984]).

(9) Miscellaneous sources, including auditing texts (e.g., Arens and Loebbecke [1984]; Carmichael and Willingham [1979]) and books

on accountants' liability (e.g., Causey [1982]; Davies [1983]; and Jaenicke [1977]).

From these sources a total of 472 cases were identified. A client/audit firm combination counts as one case. This means multiple actions (both criminal and civil; by investors, creditors, regulators, or bankruptcy trustees) regarding similar services and issues count as one case. Nearly all cases entail lawsuits filed in federal or state courts. The few remaining cases involve auditor payments to avoid litigation over allegations of audit failure.[12] Finally, some actions included more than one audit firm as defendant, primarily due to related companies with different auditors or companies changing auditors. Since allegations of audit failure were made against all auditors, these situations were counted as a case for each audit firm.

Section III uses the full sample of 472 cases to examine differences in litigation occurrences among auditors—without regard to case outcomes. Section IV considers resolution data for a reduced sample of 183 cases.[13] The resolution sample is smaller because some cases are not yet resolved. Also, sources reviewed for information on auditor litigation did not necessarily reveal all resolved cases. Thus, 183 cases do not capture all resolved cases in the 472, just resolved cases for which resolution data were available in the sources previously outlined.

III. RESULTS: LITIGATION OCCURRENCES

Overall Sample Comparisons

Table 2 presents total number of cases ($n=472$) for each Big Eight firm and the group of non-Big Eight firms. These cases comprise public companies, closely-held companies, municipalities, charities, and other non-public entities, along with a few companies of indeterminable ownership. However, most of the sample consists of public companies ($n=343$) and Table 2 provides the number of public company cases for each Big Eight firm and the group of non-Big Eight firms.

Before comparing among auditors, numbers in Table 2 require scaling because of differences among sample firms in numbers of audit clients served. The study uses two methods of scaling litigation occurrences. First, from data on audit clients and changes in clients (see *PAR*, *WAA*, McConnell [1984], etc.), an estimate of number of audit clients served during 1960–1985 is computed for each firm and grouping of firms.[14] As this estimate encompasses only public clients, it is used to scale public company litigation cases. Table 3 (column 1) shows the resulting 26-year litigation occurrence rates for each Big Eight firm and Big Eight/non-Big Eight groupings.[15]

As a second method of scaling, the study uses estimated annual U.S. audit-

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[12] For public companies, auditor settlements to avoid litigation may be disclosed in proxy statements or 8-K's. For both public and closely-held companies, some such payments receive press disclosure (*PAR*, *WSJ*).

[13] Resolution data pertain to auditors' litigation. In all but a few cases auditors comprise just one of a number of defendants. Although auditors' resolutions may not be independent of resolutions by other parties, resolutions for non-auditor defendants are not considered in the study.

[14] The number of clients for each firm and grouping of firms are as follows: AA (1,665); AY (807); CL (1,345); DHS (1,053); EW (1,228); PMM (1,456); PW (1,024); TR (1,024); Big Eight (9,602); and non-Big Eight (1,100).

[15] Big Eight rates and rankings are sensitive to the denominator computation. For example, using numbers from *WAA* [1976] (viewed as an average of 1960–1985 client base) results in the following ranking: TR, PMM, AA, AY, PW, CL, DHS, and EW. Using *WAA* [1976–1985] to compute an average number of public clients produces the following ranking: PMM, PW, AY, AA, TR, CL, DHS, and EW. However, each of these two rankings is significantly associated with the ranking in Table 3 (column 1), based on Spearman correlation coefficients of .67 and .95, respectively.

TABLE 2
NUMBER OF CASES CLASSIFIED BY AUDIT FIRM AND TIME-PERIOD
(1960-1985)

	All Cases			*Public Company Cases*		
	Total	*1960-1972*	*1973-1985*	*Total*	*1960-1972*	*1973-1985*
Big Eight						
AA	64	25	39	56	23	33
AY	35	14	21	26	11	15
CL	45	11	34	34	9	25
DHS	31	14	17	23	9	14
EW	39	17	22	29	12	17
PMM	72	29	43	53	21	32
PW	45	13	32	36	12	24
TR	50	18	32	30	13	17
Subtotal	381	141	240	287	110	177
Non-Big Eight	91	40	51	56	25	31
Total	472	181	291	343	135	208

related revenue for 1984 and 1985 from *PAR.*[16] Since this estimate consists of both public and non-public clients, it serves as a denominator with total cases as a numerator. Computed litigation occurrence rates (per $MM of revenue) are shown in Table 3 (column 2).

Although rankings in Table 3 (columns 1 and 2) are significantly associated (Spearman correlation coefficient =.71), the two methods of computing litigation occurrence rates result in slightly different positions for some Big Eight firms. Perhaps the most notable shift in rank occurs with TR's movement from fifth (column 1) to first (column 2). Otherwise, PMM and AA tend to rank near the top (higher activity) and CL, DHS, and EW tend to rank near the bottom (lower activity) under both computations.

To address a central question—are litigation occurrences independent of Big Eight firm identity?—an 8 × 2 contingency table and chi-square statistic is used. For each Big Eight auditor, public clients served during 1960-1985 (see footnote 14) are classified into two categories, clients with/without auditor litigation. A computed chi-square (9.0) is not significant at the .10 level. While litigation frequencies differ among Big Eight firms, differences are not statistically significant.

A similar test using a 2 × 2 contingency table, comparing Big Eight and non-Big Eight public clients with/without litigation (see footnote 14) is significant (at the .005 level). A computed chi-square (14.5) reflects a greater number of cases than expected for non-Big Eight firms. This result appears consistent with prior research supporting Big Eight firms as quality-differentiated auditors (Francis and Simon [1987]; Palmrose [1986]).

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[16] Big Eight rankings were not altered with a denominator based on an average of U.S. audit revenues from 1971-1972, 1977, 1982, 1983, 1984, and 1985 collected from various sources.

TABLE 3
AUDIT FIRM LITIGATION RATES
(26 YEAR RATES 1960-1985)

	Using Cases Filed				*Using Meritorious Cases*			
	PCC/ENPC[a] (*1*)		*TC/EAR* (*2*)		*EMCPC/ENPC* (*3*)		*EMC/EAR* (*4*)	
Big Eight								
	PMM	3.6%	TR	17.7%	TR	2.4%	TR	12.4%
	PW	3.5%	PMM	13.4%	AA	2.3%	PMM	8.4%
	AA	3.4%	AA	11.8%	PMM	2.2%	AA	8.3%
	AY	3.2%	PW	11.7%	CL	2.1%	CL	7.7%
	TR	2.9%	AY	11.4%	DHS	1.9%	DHS	6.8%
	CL	2.5%	CL	9.3%	EW	1.8%	PW	4.7%
	EW	2.4%	DHS	9.1%	PW	1.3%	EW	4.0%
	DHS	2.2%	EW	8.3%	AY	0.4%	AY	2.3%
Big Eight		3.0%		11.4%		1.9%		6.9%
Non-Big Eight		5.1%		16.7%		3.8%		10.6%

[a] PCC = Public Company Cases Filed
ENPC = Estimated Number of Public Clients (1960-1985)
TC = Total Cases Filed
EAR = Estimated Annual U.S. Audit-Related Revenue (MM)
EMCPC = Estimated Meritorious Cases for Public Companies
EMC = Estimated Meritorious Cases

This comparison of auditor litigation rates does not consider differences in auditors' client portfolios (other than portfolio size) that may affect likelihood of auditor litigation irrespective of audit quality supplied, including differences in client industry affiliations. Furthermore, comparisons aggregating data over 1960-1985 do not consider time-series variations in auditor litigation occurrences. These two issues are discussed below.

In interpreting results of this section, it should be noted that litigation represents a rare occurrence relative to numbers of clients served by auditors. The low rates may inhibit users' attempts to distinguish among auditors.[17] In addition, a small numbers problem becomes magnified when comparing litigation occurrences intra-industry and/or across time.

Intra-Industry Comparisons

This section compares auditor litigation occurrences within the context of client industries. There are several reasons for making comparisons intra-industry. First, auditors differ in their client industry concentrations (Palmrose [1986]). Second, studies of auditor litigation (Palmrose [1987]; St. Pierre and Anderson [1984]) found severe financial distress, including bankruptcy, to be a factor in auditor litigation.[18] Third, profiles of business failures reveal differences in frequencies of company failures on an industry basis (*WSJ* [December 15, 1986], p. 29).[19] Together, these three considerations suggest propensity for auditor litigation may be influenced by business risks as captured through client industry affiliations. In essence, examining auditor litigation intra-industry may yield different insights than those from overall comparisons.

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[17] From a perspective of users' awareness of auditor litigation, an even smaller number of occurrences should be considered "observable," therefore, available to users in making comparisons among auditors. For example, only a portion of the cases (approximately 50 percent) received widespread public disclosure (as evidenced by inclusion in the *WSJ*).

[18] Auditor litigation involving clients with financial difficulties cannot be viewed as simply users with losses looking for deep pockets. Palmrose [1987] found that legal cases involving financial difficulties frequently occur in conjunction with management fraud.

Tables 4 and 5 profile client industry affiliations for the 472 cases in the sample. Table 4 presents percentage of cases in each industry for the total sample, each Big Eight firm, and non-Big Eight firms as a group. Supplementing data in Table 4, Table 5 presents a percentage breakdown of cases in each industry by auditor (each Big Eight auditor and non-Big Eight firms as a group).

Focusing on percentages for the total sample in Table 4, some industries have higher (lower) incidences of litigation than expected given relative numbers of companies. Computers and electronics (SIC codes 357 and 366) provides an illustration. Computers and electronics represents eight percent of total legal cases in the sample. Yet, companies from this industry comprise only about five percent (445 of about 9,000 companies) in *WAA* [1980].[20]

To develop implications of client industry on auditor litigation rate comparisons, again consider computers and electronics. For each Big Eight firm, litigation rates within this industry are computed. The number of public company legal cases in computers and electronics (37 cases in Table 5 reduced by one nonpublic case (AY)) is used as the numerator and the number of public clients in the industry, based on data from *WAA* [1980], serves as a denominator. Computed litigation rates for each Big Eight firm are as follows:

(1) AA	16.4%	(5) TR	9.5%
(2) DHS	15.4%	(6) PMM	7.0%
(3) CL	14.7%	(7) AY	6.1%
(4) PW	10.3%	(8) EW	2.1%

This ranking of Big Eight firms appears quite different from the ranking in Table 3 (column 1). Furthermore, the two rankings are not significantly associated, based on a computed Spearman correlation coefficient of −.05. Using computers and electronics as an illustrative industry, intra-industry assessments of auditors with low (high) litigation activities differs from assessments made using data aggregated across industries.

However, it should be emphasized that, intra-industry, a paucity of cases for individual audit firms, presents an underlying problem. Because of small numbers of cases, slight differences in numbers can have large effects on occurrence rates and rank-orderings. From the users' perspective, this problem may undermine any usefulness of litigation in comparing among auditors. Small numbers would make it difficult to estimate true industry litigation rates from observed auditor litigation, thus making it difficult to distinguish meaningfully among auditors.

Time-Period Comparisons

Using the timeframe of the alleged audit failure, Table 2 provides a breakdown of cases into two time-periods—(1) 1960–1972 and (2) 1973–1985. Table 2

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[19] Industry analysis is also consistent with the more general issue of assessing audit quality intra-industry. For example, industry-specific regulations and accounting can translate into unique audit considerations. Thus, litigation activities involving an auditor in one industry, say banking, may not provide meaningful information on quality supplied by that auditor in a quite different industry, say utilities.

[20] Using a 2 × 2 contingency table and a chi-square statistic, a computed chi-square of 9.5 is significant (at the .005 level), with a greater number of legal cases than expected in computers/electronics given the relative number of companies in the industry.

TABLE 4

AUDIT FIRM CASES CLASSIFIED BY INDUSTRY (AS A PERCENTAGE OF TOTAL FOR FIRM)
(1960–1985)

	Total	*AA*	*AY*	*CL*	*DHS*	*EW*	*PMM*	*PW*	*TR*	*NB8*[a]
Agriculture	2%	2%			3%		4%	2%		2%
Mining and Construction (Including Oil and Gas)	7%	11%	8%	13%	3%	5%	6%	11%	8%	1%
Manufacturing										
Computers and Electronics	8%	16%	8%	11%	13%	3%	4%	9%	4%	6%
Other	20%	28%	26%	18%	23%	31%	14%	16%	16%	19%
Transportation, Communications, Electric, Gas, and Sanitary Services	6%	8%	3%			3%	6%	20%	4%	5%
Retail and Wholesale Trade	6%	3%	3%	7%	3%	8%	8%	9%	10%	4%
Finance, Insurance, and RE										
Brokers and Dealers	4%	2%	6%	2%	10%	5%	1%		6%	8%
REIT's	3%		6%	5%			7%	9%	2%	1%
RE Development	4%	3%	6%	2%	3%	3%	3%		4%	8%
Mutual Funds	2%	3%	3%	2%	6%	2%	1%	2%		2%
Banks and Savings & Loans	9%	9%	6%	2%	13%	18%	15%	5%	10%	6%
Insurance	5%	6%		13%	3%	5%	6%		6%	3%
Other	3%		3%	5%	7%	3%	4%	2%		2%
Subtotal	30%	23%	30%	31%	42%	36%	37%	18%	28%	30%
Services										
Computer and Data Processing	3%		3%	4%		2%	6%	2%	4%	3%
Other	6%	6%	8%		7%	5%	4%	7%	6%	9%
Miscellaneous (Including Charities and Municipalities)	2%		8%	5%		2%		2%	2%	2%
Unknown	10%	3%	3%	11%	6%	5%	11%	4%	18%	19%
Total (Percent)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Total (Number of Cases)	472	64	35	45	31	39	72	45	50	91

[a] NB8 = Non-Big Eight

TABLE 5
INDUSTRY CASES CLASSIFIED BY AUDITOR (AS A PERCENTAGE OF TOTAL FOR INDUSTRY) (1960–1985)

	Number of Cases	*Percentage*									
		Total	*AA*	*AY*	*CL*	*DHS*	*EW*	*PMM*	*PW*	*TR*	*NB8*
Agriculture	8	100%	13%			12%		38%	12%		25%
Mining and Construction (Including Oil and Gas)	33	100%	21%	9%	19%	3%	6%	12%	15%	12%	3%
Manufacturing											
Computers and Electronics	37	100%	27%	8%	14%	11%	3%	8%	11%	5%	13%
Other	96	100%	19%	9%	8%	7%	13%	11%	7%	8%	18%
Transportation, Communications, Electric, Gas, and Sanitary Services	27	100%	19%	4%			4%	15%	33%	7%	18%
Retail and Wholesale Trade	29	100%	7%	4%	10%	3%	10%	21%	14%	17%	14%
Finance, Insurance, and RE											
Brokers and Dealers	20	100%	5%	10%	5%	15%	10%	5%		15%	35%
REIT's	15	100%		13%	13%			33%	27%	7%	7%
RE Development	18	100%	11%	11%	6%	6%	6%	11%		11%	38%
Mutual Funds	11	100%	19%	9%	9%	18%	9%	9%	9%		18%
Banks and Savings & Loans	43	100%	14%	5%	2%	9%	17%	26%	5%	11%	11%
Insurance	23	100%	17%		26%	5%	9%	17%		13%	13%
Other	12	100%		8%	17%	17%	8%	25%	8%		17%
Subtotal	142										
Services											
Computer and Data Processing	14	100%		7%	14%		7%	29%	7%	14%	22%
Other	28	100%	14%	11%		7%	7%	11%	11%	11%	28%
Miscellaneous (Including Charities and Municipalities)	10	100%		30%	20%		10%		10%	10%	20%
Unknown	48	100%	4%	2%	10%	4%	4%	17%	4%	19%	36%
Total	472										

reveals that the latter period has a greater number of legal cases. Also, the relative litigation activity of each firm is not necessarily similar across time. For example, based on litigation occurrence rates for public companies, Big Eight firm rankings in each (arbitrarily selected) period, 1960–1972 and 1973–1985, are as follows:

1960–1972		*1973–1985*	
TR	2.7%	PW	3.7%
AY	2.2%	PMM	3.4%
AA	2.1%	CL	3.3%
PMM	1.9%	AY	3.2%
PW	1.6%	AA	3.1%
DHS	1.6%	TR	2.8%
EW	1.5%	DHS	2.5%
CL	1.4%	EW	2.1%

Rankings for these two periods are not significantly associated (Spearman correlation coefficient=.05).[21] All firms shift positions between periods, notably TR (from first to sixth), CL (from eighth to third), and PW (from fifth to first). To the extent shifts in firms' relative litigation activities do not reflect fundamental changes (improvements or reductions) in audit quality, any usefulness of litigation in distinguishing among auditors on the basis of quality diminishes.

IV. Results: Litigation Resolutions

The prior section analyzed litigation against independent auditors based on allegations of audit failures without regard to outcomes of the litigation process. Since outcomes can yield insights on merits of allegations, resolution data can supplement litigation occurrences in assessing auditor quality. This section examines litigation resolutions and compares resolutions with litigation occurrences.

As previously noted, resolution information was located for 183 of the 472 cases in the sample (of the 183 cases 137 involve public companies). Table 6 classifies resolution information in two categories, (1) case dismissed and/or no auditor payments and (2) auditor payments (including payments under out of court settlements, court imposed judgments, and agreements to avoid litigation). Table 6 presents the number of cases in these two resolution categories for each Big Eight firm and Big Eight/non-Big Eight groupings. Information is provided for both the 183 cases and the subset of 137 public company cases.

With a few exceptions, all cases involve full and complete settlement of all actions and claims against auditors. Because exceptions consist of partial settlements requiring large (over $1 million) auditor payments, it seems reasonable to include these "not fully settled" cases in the analysis. Finally, settlement amounts do not consider any subsequent recovery by auditors from other defendants, as this information tends not to be available.

The association between type of resolution (payments/no payments) and auditor identity is assessed using a chi-square statistic and a 2 × 2 contingency table for Big Eight/non-Big Eight groupings. Computed chi-squares are not significant (at the .10 level) using either all cases (.16) or only public company cases (1.03). However, within the Big Eight (using an 8 × 2 contingency table) computed chi-squares (of 17.55 for all cases and 23.92 for public company cases) are significant (at less than the .05 level). In both computations, AY and PW have

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[21] Comparing rankings for each subperiod with aggregate rate rankings (Table 3 column 1) reveals a significant association between aggregate and subperiod 2 rankings but not between aggregate and subperiod 1 rankings (Spearman correlation coefficients are .45 and .79, respectively).

TABLE 6

RESOLUTION DATA

NUMBER OF CASES CLASSIFIED BY AUDIT FIRM

(1960–1985)

	All Cases			*Public Company Cases*		
	Total	*Dismissed or No Payments by Audit Firm*	*Payments by Audit Firm*	*Total*	*Dismissed or No Payments by Audit Firm*	*Payments by Audit Firm*
Big Eight						
AA	26	8	18	23	7	16
AY	14	11	3	10	9	1
CL	23	4	19	17	3	14
DHS	11	3	8	7	1	6
EW	12	6	6	8	2	6
PMM	29	11	18	23	8	15
PW	20	12	8	17	11	6
TR	17	5	12	12	2	10
Subtotal	152	60	92	117	43	74
Non-Big Eight	31	11	20	20	5	15
Total	183	71	112	137	48	89

more cases dismissed (and fewer cases with payments) than expected.

The statistically significant association between auditor and type of resolution suggests resolution data may alter the interpretation of low (high) activity auditors based on litigation occurrence data. Litigation rates were recalculated for each Big Eight firm using only estimated meritorious cases. Meritorious cases are estimated by deleting non-meritorious cases from numbers in Table 2 using each firms' relevant dismissal percentage (based on numbers in Table 6 for either all cases or only public company cases). Note, this recomputation assumes cases with auditor payments represent meritorious allegations (i.e., audit failures) and cases with auditor dismissals/no payments represent non-meritorious allegations.

Table 3 presents these adjusted rates for meritorious public company cases scaled by estimated public clients (column 3) and all meritorious cases scaled by estimated annual audit revenue (column 4). Firm rankings appear only slightly sensitive to the scaling procedure and rankings in columns 3 and 4 are significantly associated (Spearman correlation coefficient = .95).

Using Table 3 and comparing Big Eight rankings from public company *occurrence* rates (column 1) versus public company *meritorious* litigation rates (column 3), reveals that resolution data cause each Big Eight firms' position to shift. Notable shifts include, AY (fourth to eighth), PW (second to seventh), and TR (fifth to first). Ranks in columns 1 and 3 of Table 3 are not significantly associated (Spearman correlation coefficient = .09).

Under the alternate scaling procedure (estimated annual audit-related revenues), Big Eight firm rankings appear slightly affected when using estimated meritorious cases (column 4) rather than all cases filed (column 2). Firm rankings in columns 2 and 4 of Table 3 are significantly associated (Spearman correlation coefficient = .74). However, assessments of individual firms may still be altered. In particular, AY moves to a low activity firm with the use of resolution data (i.e., from fifth to eighth position).

Finally, using resolution data and considering only meritorious public company cases shows significant differences in litigation rates among Big Eight auditors. An 8 × 2 contingency table in which each Big Eight firms' estimated public clients during 1960–1985 (see footnote 14) are classified into those with meritorious litigation and those with either no litigation or non-meritorious litigation yields a chi-square statistic of 16.63. The null hypothesis of no association between auditor identity and "true" public company audit failure frequencies can be rejected at less than the .05 level.

In summary, while assessments of Big Eight/non-Big Eight groupings remain unaffected when considering litigation outcomes, assessments of firms within the Big Eight are altered. Adjusting Big Eight litigation rates using resolution data does change identities of low (high) activity Big Eight firms. Furthermore, comparisons of public client audit failure frequencies reveal significant differences among Big Eight firms.

Size of Auditor Payments

This section provides a disaggregation of auditor payments to discuss several issues related to payment size. Classifying auditor payments of all amounts into one category of meritorious litigation does not recognize that small auditor payments may be regarded as reasonable actions to avoid the expenses of protracted litigation and not as indications of low quality audits. In addition to reducing litigation costs, small out of court settlements may minimize adverse publicity from litigation, and, therefore, minimize reputation effects. Certainly this issue is not clear-cut as alternate arguments exist for avoiding even token payments to settle non-meritorious allegations (see footnote 8). The study does not attempt to resolve this controversy, rather, small payments are reclassified as non-meritorious litigation to determine any effects on assessments of low (high) activity Big Eight firms.

To provide insight into the prevalence of small versus large auditor payments, Table 7 presents a breakdown of all resolved cases into percentages in each of three categories: (1) auditor dismissed/no auditor payments, (2) auditor payments of less than $1 million, and (3) auditor payments in excess of $1 million. The two categories of payments under and over $1 million represent somewhat gross categorizations for small and large payments. For example, payments were described in data sources as "small" or "minor" contributions to settlement funds rather than specified amounts. This lack of precise specification precludes a finer partitioning of resolution data.

AY has the highest percentage of cases dismissed (79 percent), DHS has the highest percentage of cases with payments under $1 million (55 percent), and TR has the highest percentage of cases with payments over $1 million (53 percent). These percentages can be compared with percentages for Big Eight firms as a group of 40 percent, 31 percent, and 29 percent, respectively.

DHS appears as the Big Eight firm most affected by classifying smaller payments along with dismissals/no payments as non-meritorious cases, leaving only payments in excess of $1 million as

TABLE 7
AUDIT FIRM RESOLUTION DATA CLASSIFIED BY TYPE OF RESOLUTION
AS A PERCENTAGE OF TOTAL BY FIRM
(1960–1985)

		Percentage of Cases		
	Number of Cases	*Dismissed or No Payments by Audit Firm*	*Audit Firm Payments Under $1 million*	*Audit Firm Payments $1 million and Over*
Big Eight				
AA	26	30%	35%	35%
AY	14	79%	14%	7%
CL	23	17%	48%	35%
DHS	11	27%	55%	18%
EW	12	50%	25%	25%
PMM	29	38%	34%	28%
PW	20	60%	20%	20%
TR	17	29%	18%	53%
Subtotal	152	40%	31%	29%
Non-Big Eight	31	36%	32%	32%
Total	183	39%	31%	30%

audit failures. Recomputing meritorious litigation rates under this approach and ranking the Big Eight, shifts DHS's position to eighth with the following rank-order: TR, AA, PMM, CL, EW, PW, AY, and DHS (as compared to the ranks in Table 3 column 3).

It is tempting to argue AY's high dismissal/no payment rate (79 percent in Table 7) represents a consequence of fighting all litigation [Liggio, 1978]. Likewise, DHS's settlement rate (55 percent) for payments under $1 million may reflect a posture of making minimal payments to avoid further expense of litigation. However, the nature of the claims cannot be ignored. For example, Palmrose [1987] provides evidence that management fraud cases are more likely to entail auditor payments rather than dismissals/no auditor payments. DHS has the highest percentage of cases with management fraud (58 percent) and AY has the lowest (23 percent) for Big Eight firms.

Furthermore, resolution data in Table 7 suggest inconsistencies with AA's reported posture of settling even nonmeritorious cases [Klott, 1984]. While AA's percentage of cases dismissed/no payments appears somewhat lower than Big Eight firms as a group, AA's percentage is not among the lowest. Also, percentages for both large and small payments are not dramatically above percentages for Big Eight firms as a group.

V. SUMMARY AND CONCLUDING REMARKS

This study compared litigation activities among the largest U.S. independent audit firms. The primary objective was to assess litigation as a means for making quality distinctions among auditors using an inverse relation—auditors with relatively low (high) litigation activity represent higher (lower) quality suppliers. Litigation activity included both occurrences and resolutions of actions against auditors involving allegations of audit failure. Resolution data were included to help determine the merits of claims against auditors. Using resolutions assumed that courts dismiss (auditors avoid payments of) non-meritorious allegations while meritorious allegations require auditor payments.

The empirical analysis examined a sample of legal cases ($n=472$) and resolutions, if available ($n=183$), involving both Big Eight and large non-Big Eight firms during 1960–1985. Results indicate that non-Big Eight firms as a group had higher litigation occurrence rates than the Big Eight. This result was not altered by considering the merits of claims from resolution data. In essence, this result is consistent with existing research supporting the Big Eight as quality-differentiated auditors.

Comparing within the Big Eight, the study found some significant differences in litigation activity, particularly when focusing on meritorious litigation. However, these classifications were not unambiguous as results appeared sensitive to the type of analysis. Furthermore, identities of low (high) activity firms changed when conducting comparisons intra-industry and across time. This inability to consistently identify the same firms as low (high) activity tends to weaken litigation as a basis for quality-differentiating among auditors. In addition, litigation against auditors is a rare occurrence. This leaves small numbers of cases from which to reasonably estimate auditors' relative litigation activities, thereby increasing the difficulty in distinguishing among firms.

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The Effectiveness of Statistical Analytical Review as a Substantive Auditing Procedure: A Simulation Analysis

W. Robert Knechel

ABSTRACT: The purpose of this paper is to assess via simulation the effectiveness of various analytical review procedures when used in combination with a partitioned approach to dollar unit sampling for tests of account details. Seven analytical review procedures based on regression analysis were applied to two sets of simulated accounting data which were seeded with different patterns of known overstatement errors. Audit sample sizes for dollar unit sampling and achieved audit detection risk were then computed based on the analytical review outcomes. There were three major findings in this study. First, regression based analytical review increased audit effectiveness relative to an audit strategy that did not use analytical review. Second, the use of monthly data greatly increased the effectiveness of analytical review. Finally, regression based analytical review models were very efficient in detecting potentially material misstatements.

ANALYTICAL review is a substantive auditing procedure that examines the accuracy of account balances without considering the details of individual transactions which make up the account balance. In analytical review, the auditor compares an expected value with the actual balance to identify those accounts where further audit testing seems needed. SAS No. 23 [1978] indicates that analytical review can be used as a planning aid, a substantive audit test, or an overall review of audit results.

The purpose of this study is to examine the interaction of various regression based analytical review procedures (ARPs) used as substantive tests and sampling plans that are used for tests of details. Of particular concern is the combined effectiveness of ARPs and detailed testing procedures in detecting material errors. This paper extends prior research on the ability of substantive ARPs to detect monthly account discrepancies [Kinney and Salamon, 1978, 1982; Knechel, 1986; and Collins, 1980]

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W. Robert Knechel is Associate Professor at the Fisher School of Accounting, University of Florida-Gainesville.

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by considering the interaction of results from analytical review with dollar unit sampling used for tests of details.

Simulation techniques are used to generate account balance data that are then used to test the effectiveness of various ARPs in detecting material errors. Ideally, ARPs should be tested using actual accounting data. Such an approach would provide direct evidence about the relative effectiveness of ARPs. Using actual audit results creates at least two problems, however. First, short of performing a census audit, it is impossible to determine the actual extent of error in the accounting population and, thus, it is impossible to evaluate the true effectiveness of the ARPs. Second, the use of census audit data even for several audits would constrain the generalizability of the results since ARPs could only be examined under limited error conditions.

The choice of ARP, materiality level, degree of reliance on analytical review, and selection of samples for detail testing are interrelated issues. Furthermore, there is no formal model currently available to relate these factors. The individual, and potentially interactive, stochastic properties of these factors and the underlying error distributions significantly increases the difficulty of algebraicly analyzing the unique effect of each factor on audit effectiveness.[1] With these constraints in mind, a simulation method was selected in order to analyze various ARPs under a wide range of conditions that correspond to realistic accounting populations.

This paper is organized as follows. A brief discussion of analytical review is provided in the first section. In the second section, the expectation model and seven investigation rules are described. The basic simulation model is also presented, along with a discussion of the underlying assumptions. The third section presents results for the seven ARPs with audit effectiveness measured in terms of (*DUS*) sample sizes and the risk of undetected material errors. The final section provides a summary and discussion of limitations.

I. AN OVERVIEW OF ANALYTICAL REVIEW AND PREVIOUS FINDINGS

Analytical review procedures rely upon an auditor's ability to generate an expectation of an account based upon knowledge of a company's business and operating environment. Possible forms of auditor expectation models have been extensively tested by auditing researchers [e.g., Arrington, Hillison, and Icerman, 1983]. Regression models have been found to be particularly useful prediction models in many accounting applications. The quality of the expectation model is not the sole determinant of how well an ARP performs, however. Knowledge of the interaction of the expectation model with specified investigation rules is also critical to the effective implementation of ARPs. Kinney [1979b], Stringer [1975], and Kinney, Salamon, and Uecker [1986] have proposed sophisticated investigation rules to be used in conjunction with regression analysis.

Kinney and Salamon [1982] compared the Kinney [1979b] strategy to the Stringer strategy (called STAR denoting Statistical Technique for Analytical Review) using simulated monthly account data. They tabulated how often each method falsely signaled an error in a correct account (Type I error) or failed to detect a materially misstated account (Type II error). Kinney and Salamon found that STAR[2] had fewer Type I errors than the Kinney strategy but had more Type II errors when the errors were large and widely dispersed in the population.

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[1] Accounting error distributions may be discrete, discontinuous and not conform to typical theoretical forms. These characteristics would greatly limit the tractability of any analytic model of the audit process [Knechel, 1985].

The analysis of Type I and Type II errors provides some indication of the relative effectiveness of various ARPs. An auditor, however, is not necessarily interested in how a single audit procedure performs in isolation but is interested in how well an audit strategy performs in total. Kinney [1979b] developed a model to integrate regression results from analytical review with a partitioned approach to dollar unit sampling (*DUS*) used for tests of account details. He found that the use of regression analysis could reduce sample sizes substantially. Two questions arise from Kinney's analysis. First, can similar benefits be obtained when other ARPs are used? Second, and more important, what effect does the use of ARPs have upon the risk that the combined audit procedures fail to disclose existing material misstatements?

There is little or no empirical evidence currently available that directly relates the performance of ARPs to audit detection risk or audit effectiveness. Hylas and Ashton [1982] analyzed actual audit errors and determined that about one-fourth were initially discovered using analytical review tests. However, while ARPs may indicate the existence of an unusual account fluctuation, they do not directly identify the fluctuation's cause or provide verification that an account is misstated. In general, only further tests of account details provides evidence which is sufficiently conclusive to warrant adjusting the financial statements. Consequently, the overall effectiveness of an audit plan depends on the interaction between the ARPs and subsequent audit tests.

The present study extends the initial work of Kinney [1979b] and Kinney and Salamon [1982]. First, by building upon the model proposed by Kinney [1979b], the quality of ARPs is determined in terms of (1) the implied sample size for detail testing and (2) the probability or risk that the combined audit approach fails to detect material errors.[3] Second, seven investigation rules are examined: STAR [Stringer, 1975], the original Kinney [1979b] rule, two proposed by Kinney, Salamon, and Uecker [1986], and three simpler rules not previously tested. Finally, the ARPs are tested for sensitivity under different stochastic conditions.

II. MODEL SPECIFICATIONS

Expectation Model and Investigation Rules

Assume that the auditor is concerned with determining if an income statement account (say, sales) is free of intolerable overstatement errors. Let x_t reflect the recorded balance in month t, let y_t represent the correct (but unknown) balance of that account, and let e_t be the error in the account prior to the audit, i.e., $e_t=x_t-y_t$. For simplicity, assume that all errors in individual items are greater than zero ($e_{ti}\geq 0$ where i denotes a particular item within period t). That is, only overstatements of individual items which comprise the account will be considered.[4] Finally, let y_t' be the expected balance in the account given the auditor's expectation model.

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[2] STAR is the acronym used to identify the multivariate statistical approach to analytical review used by Deloitte, Haskins and Sells. The formulas used in this study are based on the univariate format of STAR and, as such, reflect the actual application of STAR to a situation with only one dependent variable.

[3] The Kinney [1979b] model for *DUS* differs from that actually used by DH&S for STAR and *DUS*. The intent of this paper is to test the STAR model (as well as the others) as an ARP, not to test the DH&S *DUS* approach. The use of a single model for determining sample sizes allows the comparison of various ARPs since they are all subject to the same modeling assumptions. It should be noted, however, that the follow-up of discrepancies, as modeled in this paper, is not the formal practice used by DH&S.

The corresponding annual values will be represented by X_T, Y_T, E_T, and Y_T'. These are defined by the following relations:

$$X_T = \sum_{t=t^*+1}^{t^*+12} x_t \qquad (1.1)$$

$$Y_T = \sum_{t=t^*+1}^{t^*+12} y_t \qquad (1.2)$$

$$E_T = \sum_{t=t^*+1}^{t^*+12} e_t = X_T - Y_T \qquad (1.3)$$

where t^* is the month preceding the audit period. The index T is equal to the integer part of the expression $(t^*+12)/12$.

The use of monthly data creates an added difficulty when applying analytical review since monthly balances are rarely audited or adjusted for errors discovered during the annual audit. In practice, this situation will cause measurement error in the base period ($t \leq t^*$) and lead to larger prediction residuals [Kinney and Salamon, 1978]. For purposes of this study, assume that the monthly data during the estimation period is error-free (i.e., has been adjusted for previously discovered errors).

In applying analytical review, the auditor generates either y_t' or Y_T' for the audit period and compares it to the actual results (i.e., x_t or X_T) to determine whether a significant discrepancy exists. The auditor's subsequent actions will depend upon the investigation rule used, the auditor's assessment of tolerable monetary error, the desired level of detection risk (DR), and the reliance to be placed upon the analytical review evidence *vis-a-vis* evidence from tests of details.

Expectations for the audit period are generated using a univariate regression model based on 36 observations of x_t and z_t.[5] That is,

$$y_t' = a + b \cdot z_t \text{ for } t > t^*$$

where a and b are regression parameters estimated using data from the period $t=1$ to $t=36$ and z_t is the independent variable related to x_t.

The performance of an ARP depends upon the investigation rule used as well as the predictive accuracy of the expectation model. Coakley [1982] identified three types of investigation rules that are often used singly or in combination to determine whether the deviation of actual balances from expected balances is significant:

1. Judgment-based rules—Does the deviation exceed an arbitrary threshold (e.g., ten percent of previous balance)?
2. Materiality-based rules—Does the deviation exceed tolerable error?
3. Statistically-based rules—Does the deviation exceed a specified multiple of the standard error?

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[4] The use of overstatement errors is largely consistent with evidence reported by Kinney [1979a], Johnson, Leitch and Neter [1981], and Ham, Losell and Smieliauskas [1985] for revenue and receivables, i.e., revenue errors tend to be overstatements. Furthermore, this assumption represents a worst case scenario. If understatement errors were included, some errors would offset and, although of interest to the auditor from a control perspective, the account balance taken as a whole might not be materially misstated.

[5] The selection of an appropriate independent variable is critical. Conceptually, the independent variable could be another account balance (as long as it isn't structurally colinear with the dependent variable). The regression analysis used in this study implicitly assumes that the independent variable is free of accounting error. That is, the independent variable might be generated external to the firm, be generated by a structurally independent process, or be previously audited.

Statistical investigation rules can only be used in conjunction with a statistical expectation model (such as regression). For the statistical investigation rules, both the level of tolerable monetary error (*M*) and significance level must be specified. The significance level is used to calculate the upper confidence limit (*UCL*) for errors. If the *UCL* exceeds the desired threshold (*M*), the auditor will conclude that there is significant risk that the account is intolerably overstated and further auditor action is warranted.

The seven investigation rules examined in this paper in conjunction with the regression model are:

1. Annual Materiality Rule (AM)—Investigate all months if *UCL* based on the sum of 12 months' data exceeds *M*.
2. Monthly Materiality Rule (MM)—Investigate any month that *UCL* exceeds $m = M/12$.
3. Combined Materiality Rule (CM)—Apply AM as described above. If a significant deviation is indicated, apply MM to determine the months to investigate.
4. Statistical Technique for Analytical Review (STAR)—Investigate any month for which *UCL* exceeeds M/k for all possible values of k ($k = 1,2,3, \ldots$). This is an iterative procedure in which *UCL* decreases as k increases.[6]
5. Kinney Residual Rule (KR)—Compare the annual *UCL* with *M*. If $UCL > M$ and no deviation is indicated, investigate all months with outliers (residual greater than 1.96 times the standard error). If a deviation is indicated, investigate the "months most likely-to-be-in-error" (those having the largest equiprobable residuals) until the uninvestigated residual has been reduced to a tolerable amount [Kinney, 1979b].
6. Kinney/Salamon/Uecker Rule without monthly filter (KSU)—Compare the annual *UCL* with *M*. If $UCL > M$, investigate all months where the prediction deviation exceeds 1.64 times the standard error [Kinney, Salamon, and Uecker, 1986].[7]
7. Kinney/Salamon/Uecker Rule with a monthly filter (KSUF)—Apply KSU as described above and, if annual *UCL* is less than *M*, investigate outliers (defined as all months where the prediction deviation exceeds 1.96 times the standard error).

The first four investigation rules are materiality based and the KR, KSU, and KSUF rules are a hybrid of materiality and statistical based investigation rules. In all cases, materiality (tolerable error for Y_T) was assumed equal to two percent of X_T but the confidence levels (based on the risk that an ARP fails to detect a material error) were varied across a realistic range. The investigation rules are summarized in Table 1.

Data Generation

The underlying series for the independent variable was generated from a single stochastic process which was assumed to

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[6] Kinney and Salamon [1982] demonstrated that the STAR investigation rule has a unique minimum so that k can be limited to a reasonable range of integer values. Specifically, they found that the minimum was less than 12 in 99.9 percent of their test conditions. Therefore, for purposes of this study, k is limited to the range one through 12.

[7] If the annual *UCL* exceeds the tolerable amount but no single month has a deviation greater than 1.64 times the standard error, *all* months are investigated.

TABLE 1

SUMMARY OF INVESTIGATION RULES

Rule	*Test Procedure*	
Annual Materiality (AM)	$UCL(1-AR)\geq M$	(1)*
Monthly Materiality (MM)	$UCL(1-AR)\geq m$	(2)
Combined Materiality (CM)	If $UCL(1-AR)\geq M$ then $UCL(1-AR)\geq m$	(1) (2)
Statistical Technique for Analytical Review (STAR)	$UCL(1-AR\mid k)\geq M/k$	(3)
Kinney Residual Rule (KR)	$x_t-y_t'\geq 1.96\ \hat{S}_e$; If $UCL(1-AR)\geq M$ then $\max\{x_t-y_t' \mid t=1\ldots 12\}$ iteratively	(1)
Kinney-Salamon-Uecker without Filter (KSU)	If $UCL(1-AR)\geq M$ then $x_t-y_t'\geq 1.64\ \hat{S}_e$	(1)
Kinney-Salamon-Uecker with Filter (KSUF)	$x_t-y_t'\geq 1.96\ \hat{S}_e$; then if $UCL(1-AR)\geq M$ also $x_t-y_t'\geq 1.64\ \hat{S}_e$	(1)

* Formulas for statistical investigation rules:

(1) $UCL(1-AR)=\sum_{t=t^*+1}^{t^*+12}(x_t-y_t')+\hat{S}_e\bullet t(1-AR,\ t^*-2)$

$$\hat{S}_e=\hat{S}\bullet\sqrt{12+\frac{144}{t^*}+\frac{144(X_T/12-\bar{x})^2}{\sum_{t=0}^{t^*}(x_t-\bar{x})^2}}$$

where

$$\bar{x}=\frac{1}{t^*}\sum_{t=0}^{t^*}x_t$$

$\hat{S}$=standard error of the regression in the basic period
$t(\bullet)$=Student's t-statistic at $1-AR$ level with t^*-2 degrees of freedom
$1-AR$=confidence level

(2) $UCL(1-AR)=(x_t-y_t')+\hat{S}_e\bullet t(1-AR,\ t^*-2)$

$$\hat{S}_e=\hat{S}\sqrt{1+\frac{1}{t^*}+\frac{(\bar{x}_t-x)^2}{\sum_{t=0}^{t^*}(x_t-\bar{x})^2}}$$

(3) $UCL(1-AR\mid k)=(x_t-y_t')+\hat{S}_e t(1-k\sqrt{AR},\ t^*-2)$
$\hat{S}_e$=same as (2)
$k=1,2,\ldots,12$.

follow a martingale with constant positive drift:

$$z_t \sim N(u_t, V(z));$$

$$u_t = u_0 + \sum_{i=0}^{t-1} g u_i;$$

where

$$g = .005,\ u_0 = 100,\ V(z) = 25.0.$$

The correct account balances (y_t) were then generated by using the following linear relation:

$$y_t = 25 + 5z_t + e$$

where

$$e \sim (0, S^2).$$

Different stochastic test conditions were induced by varying the ratio of standard error to tolerable error. This ratio (denoted *PHI*) statistically determines the magnitude of S^2, i.e., larger values of S^2 can be induced by increasing the ratio of standard error (S) to materiality. Two sets of conditions were generated and tested by using two values for this ratio ($PHI = \{0.25, 0.75\}$). If the underlying data series is subject to large random environmental variation ($PHI = .75$), the regression model will have a larger standard error of prediction resulting in less accurate classification of potentially erroneous months. Consequently, the highly variable condition is expected to result in higher audit risk and, possibly, larger sample sizes.

A total of 100 sets of 48 monthly observations were generated for each set of stochastic conditions. The first 36 observations were used as the estimation period for the expectation model (i.e., $t^* = 36$) and the last 12 were considered to be the audit period. The independent variable was generated so that the regression model had a known expected standard error and an expected R^2 of .95 [Fishman, 1978]. This technique is comparable to that used by Kinney and Salamon [1978, 1982] and yields R^2 data consistent with that found by Neter [1982] and Akresh and Wallace [1981] for actual ARP applications.

After the 48-month data series was generated, error was seeded in the 12-month audit period to obtain x_t. Three levels of error in the *annual* balance were considered: $E_T = 0$, $E_T = 2$ percent, $E_T = 4$ percent. The error levels were selected to reflect a variety of experimental conditions: no accounting error, an exactly material error, and a highly material error. The annual error was then allocated to individual months by uniformly distributing E_T over randomly selected months. Four monthly seeding patterns were tested (where *NE* is defined as the number of erroneous months):

1. E_T seeded in one month ($NE = 1$) and 11 months were error-free ($e_t = \{E_T, 0\}$).
2. E_T evenly divided among three months ($NE = 3$, $e_t = \{E_T/3, 0\}$).
3. E_T evenly divided among six months ($NE = 6$, $e_t = \{E_T/6, 0\}$).
4. E_T evenly divided among 12 months ($NE = 12$, $e_t = \{E_T/12, 0\}$).

These error allocations represent random error patterns that are more difficult to detect with ARPs as *NE* gets larger.[8]

The 12 (3 levels × 4 distributions) error seeding plans combined with the

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[8] More difficult error patterns could be contrived but many would violate the assumption of overstatement errors only. For example, errors seeded in reverse proportion to the prediction residuals (the months with the smallest residuals would contain the largest errors), would be harder to detect than the pattern assumed in this paper. An alternative approach could seed errors at the transaction level rather than the account level. Such "atomistic" seeding would require an extensive set of assumptions concerning the characteristics and volume of individual transactions.

100 randomly generated time series yield 1,200 unique time series for each set of stochastic conditions. Each ARP rule was applied to each 48-month set of observations. Parameters of the expectation models were estimated from the 36-month base period. Each expectation model was then used to determine the expected monthly balances for the audit period, i.e., y_t' and/or Y_T'. Using the predictions as input to the investigation rules, the deviation from expectation was computed.

Determining the Audit Sample Size

The auditor has a choice of responses when an ARP indicates existence of a significant deviation in an account balance. Initially, the auditor would likely seek logical explanations for the divergence [Stringer, 1975]. If such an explanation was obtained, the auditor would seek corroborating evidence. In some cases, the auditor will undertake more-than-normal tests of account details.

Results of the ARP (i.e., error or no error signal) can be incorporated into subsequent detail testing by utilizing the model suggested by Kinney [1979b] for dollar unit sampling (*DUS*). To be more specific, a *DUS* sample size was calculated for each month as follows:

$$n_t = \frac{UDR(0,\ TD)(x_t)}{M} \qquad (1.4)$$

where

$UDR(0, TD)$ = Cumulative Poisson factor for attribute sampling with 0 errors and confidence level TD.

TD = planned risk level for detail testing given the planned risk level for analytical review,

N_T = sample size for entire year = summation of n_t.

Equation (1.4) indicates that the sample size is a direct function of *TD* which, in turn, is related to the auditor's acceptable risk that material error will not be detected by planned audit procedures. In SAS No. 47, *TD* is one component of detection risk (*DR*). Detection risk is the combined risk that analytical review procedures fail to signal a material deviation *and* the risk that tests of details fail to detect a material error. The auditor sets the acceptable detection risk (*DR*) at a level such that the overall audit risk (or ultimate risk) is also acceptable given the auditor's assessment of inherent and control risk. By specifying the acceptable *DR* and the planned risk for analytical review, the risk level for tests of details (*TD*) is

$$TD = DR/AR \qquad (1.5)$$

where *AR* is the risk that an ARP does not detect existing material error. This formula, although not originally intended to be operational, is robust if *AR* is strictly defined to be the *planned* risk level and is not changed after an ARP has been applied [Kinney, 1983].

For purposes of this study, *DR* was set to five percent. If analytical review signaled a deviation, then the ARP was not relied upon ($AR = 95$ percent, indicating that the ARP failed at the planned risk level) and the risk level for tests of details was five percent.[9] If the ARP did not signal a deviation, *AR* was set to the planned risk level that was used to compute the confidence limit for regression (i.e., the four possible planned risk levels were 36 percent, 25 percent, 14 percent, or five percent). *TD* was then computed from (1.5). The 36 percent, 25 percent, and 14 percent risk levels are consistent with Kinney [1979b] and the five percent risk level, although probably not often used in practice, allowed testing of the effectiveness of each ARP in isolation from the *DUS* assumptions and provided benchmark results for comparative purposes.

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[9] This assumption is conservative because the deviation size is ignored. In reality, an auditor would consider the size and cause of individual errors when considering response options.

Determining Detection Risk

Once the sample size has been determined, the auditor selects the items to be audited and applies the audit procedure(s). The auditor computes the upper limit of error (*UCL*) for the sample, given the specified confidence level and the actual errors discovered in the sample. Therefore, the detailed *UCL* test depends upon the number of errors detected through sampling, the size of the errors (known as the "tainting" factor), and the risk level for tests of details (*TD*).

The extent of *undiscovered* error in an account can also be computed based on the sample results if the actual distribution of accounting error is known. If *UCL*(*DUS*) is less than *M*, the auditor would conclude that no material error existed in an account and no adjustment would be deemed necessary. In this case, any $E_T>0$ would remain uncorrected. If $UCL(DUS)\geq M$, however, the auditor would conclude that there is an unacceptable risk that the account is misstated by a material amount. The auditor's problem then becomes determining the appropriate response.

In this paper, the account balance is assumed to be adjusted enough to reduce the risk of material error to an acceptable level (see Arens and Loebbecke [1984], page 476). The amount of adjustment is equal to the difference between *UCL*(*DUS*) and $M(UCL(DUS)-M>0)$. Any existing error in excess of this adjustment is assumed to remain undiscovered. Regardless of the size of the adjustment, if the remaining error (E'_T) exceeds the tolerable amount, the sample has detected too few errors to be effective. The probability of discovering too few errors is conditional upon the sample size which, in turn, is contingent upon the effectiveness of the ARP. Consequently, this probability can be considered the achieved detection risk (*DR**) and can be computed by determining the *minimum* number of sample errors (given the sample size) which are needed to ensure that the remaining undiscovered error is less than tolerable error ($E'_T<M$).[10] The probability of observing fewer than this minimum number of errors is computed from the binomial distribution. All tainting factors were assumed to be 100 percent. The probability of detecting a single error in a sample was equal to E_T/X_T for the annual models and e_t/x_t for the monthly models. Computation of *DR** is illustrated in the Appendix.

Input variables and values were chosen to reflect realistic levels of accounting errors, materiality, and audit risk. Two assumptions were particularly important for developing the model and require elaboration. First, the *DUS* formulas in this study are very conservative. Evidence suggests that, in low error situations, this form of *DUS* will have an achieved risk (*DR**) much lower than planned [Neter and Loebbecke, 1975]. The second assumption, the extent and nature of the assumed error adjustment, will partially counterbalance the conservativeness of the *DUS* model. Achieved risk will be relatively higher than planned risk using this adjustment process because there exists a set of possible outcomes where *DUS* correctly indicates rejection of the account balance but the proposed adjustment is inadequate to make $E_T<M$.

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[10] The computation of *DR** depends primarily on the sample size used for tests of details. However, since the sample size is itself dependent upon analytical review results, *DR** captures both the effectiveness of dollar unit sampling as well as the ARP. For example, if an ARP falsely signals no significant deviation (Type II error), the resulting sample size will be smaller and *DR** will be higher.

III. RESULTS

Average sample size (N_T) and the expected detection risk (DR^*) were generated for each ARP under different simulated audit conditions. ARPs were evaluated for three error levels (zero percent, two percent, four percent), four error seeding patterns (i.e., uniformly distributed over one, three, six, or 12 months), and four levels of analytical review risk ($AR=5$ percent, 14 percent, 25 percent, 36 percent). Tables 2, 3, 4, and 5 present the results for each combination of error level and error seeding contingent upon the risk level. Complete results are presented for the low variance environment ($PHI=.25$) only since the results for high variance ($PHI=.75$) were comparable.

The ARP's performance relative to a non-ARP audit strategy (using only *DUS*) are also discussed.[11] *DUS* alone results provide a comparative benchmark for assessing the relative efficiency of the regression based ARPs. The average sample size for *DUS* alone was 150 and the conservative bias of *DUS* reduced the achieved detection risk from the five percent planned level to 1.59 percent for $E_T=4$ percent and to 4.83 percent for $E_T=2$ percent.

Overall Results

Tables 2 through 5 reveal a consistent pattern in the ARP's relative performance.[12] STAR and KSUF had the smallest samples and had detection risk that was both acceptable (less than five percent) and uniformly lower than the detection risk for the non-ARP audit strategy (*DUS* alone). The reduction in sample size (by as much as 50 percent) and the lower detection risk imply that both STAR and KSUF are preferable to the non-ARP approach. KSU was almost as effective as KSUF and could be considered a reasonable alternative. In the large majority of cases, however, the addition of the filter to KSU (yielding KSUF) resulted in only a small sample size increase (usually one or two items) but a substantial reduction in detection risk (up to 50 percent or more). Consequently, KSUF would seem to be preferable to KSU.

MM and KR also had detection risk less than five percent and usually less than *DUS* alone. The sample sizes for MM and KR were much larger than STAR and KSUF, however. Therefore, while MM and KR would appear to be effective, they are not nearly as efficient as the STAR and KSUF approaches. AM and CM generally exhibited detection risk which was not only higher than *DUS* alone, but often higher than the acceptable five percent level. As a result, the small reduction in average sample size that was obtained by using AM and CM was offset by a rather large increase in detection risk. Additionally, the fact that CM consistently had lower detection risk than AM emphasizes the advantage of always searching for monthly outliers.

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[11] ARPs can not have a sample size larger than *DUS* alone because reliance on *DUS* alone implies no reliance on an ARP. Any reliance on an ARP will cause sample size to be less than *DUS* alone.

[12] The set of conditions included in the analysis represent a realistic range but were not randomly selected. In order to obtain a general ranking of ARPs, the joint distribution of environmental conditions would have to be considered. For example, simple averaging would weight each observation equally even though one set of conditions may be more likely to occur than another.

TABLE 2

AVERAGE SAMPLE SIZE (*N*) AND ACHIEVED DETECTION RISK (*DR**)
FOR ANALYTICAL REVIEW RISK = 36 PERCENT
LOW VARIANCE ENVIRONMENT (*PHI* = .25)
M = 2 PERCENT

Panel A: E_T=0 Percent

ARP[a]	DR*	N	
AM	.0000	113	
MM	.0000	125	
CM	.0000	109	
STAR	.0000	101	Results are invariant to *NE* when there is no error
KSU	.0000	104	
KSUF	.0000	105	
KR	.0000	120	
DUS	.0000	150	

Panel B: E_T=2 Percent

	NE[b]=1		*NE*=3		*NE*=6		*NE*=12	
ARP	DR*	N	DR*	N	DR*	N	DR*	N
AM	.0892*	126	.0892*	126	.0892*	126	.0892*	126
MM	.0000†	127	.0000†	130	.0005†	130	.0005†	131
CM	.0636*	117	.0636*	118	.0641*	119	.0641*	120
STAR	.0010†	106	.0152†	106	.0207†	105	.0255†	104
KSU	.0260†	103	.0336†	106	.0372†	106	.0315†	107
KSUF	.0010†	106	.0171†	108	.0228†	107	.0221†	108
KR	.0000†	118	.0000†	123	.0005†	125	.0005†	125
DUS	.0483	150	.0483	150	.0483	150	.0483	150

Panel C: E_T=4 Percent

	NE=1		*NE*=3		*NE*=6		*NE*=12	
ARP	DR*	N	DR*	N	DR*	N	DR*	N
AM	.0307	140	.0307	140	.0307	140	.0307	140
MM	.0004†	127	.0009†	131	.0015†	135	.0023†	137
CM	.0183	124	.0187	126	.0191	129	.0196	131
STAR	.0003†	107	.0026†	113	.0051†	111	.0094†	108
KSU	.0115†	106	.0081†	111	.0086†	111	.0100†	114
KSUF	.0003†	107	.0026†	113	.0058†	112	.0089†	114
KR	.0004†	114	.0010†	121	.0023†	127	.0032†	129
DUS	.0159	150	.0159	150	.0159	150	.0159	150

* Detection risk exceeds acceptable level of 5 percent

† Detection risk is less than *DUS* alone

[a] AM = annual materiality
MM = monthly materiality
CM = combined materiality
STAR = Statistical Technique for Analytical Review
KSU = Kinney-Salamon-Uecker without monthly outlier filter
KSUF = Kinney-Salamon-Uecker with monthly outlier filter
KR = Kinney [1979b] rule

[b] *NE* = divisor for error seeding—$e_s = E_T/NE$

TABLE 3

AVERAGE SAMPLE SIZE (N) AND ACHIEVED DETECTION RISK (DR^*)
FOR ANALYTICAL REVIEW RISK=25 PERCENT
LOW VARIANCE ENVIRONMENT ($PHI=.25$)
$M=2$ PERCENT

Panel A: $E_T=0$ Percent

ARP[a]	DR*	N
AM	.0000	107
MM	.0000	124
CM	.0000	101
STAR	.0000	86
KSU	.0000	91
KSUF	.0000	91
KR	.0000	109
DUS	.0000	150

Results are invariant to *NE* when there is no error

Panel B: $E_T=2$ Percent

	NE[b]=1		*NE*=3		*NE*=6		*NE*=12	
ARP	DR*	N	DR*	N	DR*	N	DR*	N
AM	.1084*	122	.1084*	122	.1084*	122	.1084*	122
MM	.0007†	126	.0013†	129	.0014†	131	.0019†	132
CM	.0802*	112	.0808*	113	.0808*	114	.0814*	115
STAR	.0033†	92	.0186†	93	.0151†	92	.0214†	90
KSU	.0420†	88	.0462†	92	.0489	93	.0436†	94
KSUF	.0051†	91	.0205†	93	.0299†	94	.0301†	95
KR	.0003†	108	.0004†	114	.0009†	117	.0005†	117
DUS	.0483	150	.0483	150	.0483	150	.0483	150

Panel C: $E_T=4$ Percent

	NE=1		*NE*=3		*NE*=6		*NE*=12	
ARP	DR*	N	DR*	N	DR*	N	DR*	N
AM	.0383	140	.0383	140	.0383	140	.0383	140
MM	.0005†	127	.0009†	131	.0014†	135	.0021†	138
CM	.0252	122	.0256	125	.0259	128	.0265	131
STAR	.0003†	93	.0032†	101	.0064†	100	.0151†	97
KSU	.0177	91	.0109†	98	.0129†	98	.0172†	103
KSUF	.0003†	92	.0033†	100	.0091†	99	.0150†	103
KR	.0003†	103	.0010†	113	.0026†	120	.0043†	124
DUS	.0159	150	.0159	150	.0159	150	.0159	150

* Detection risk exceeds acceptable level of 5 percent
† Detection risk is less than *DUS* alone
[a] See definitions on Table 2
[b] See definitions on Table 2

Error Level

The seeded error level (E_T) had a significant impact on both sample size and detection risk for virtually all ARPs. For $E_T=0$ (Panel A, all tables), detection risk was zero by construction and all ARPs can be judged solely on their re-

TABLE 4

AVERAGE SAMPLE SIZE (N) AND ACHIEVED DETECTION RISK (DR^*)
FOR ANALYTICAL REVIEW RISK = 14 PERCENT
LOW VARIANCE ENVIRONMENT (PHI = .25)
M = 2 PERCENT

Panel A: E_T = 0 Percent

ARP[a]	DR*	N	
AM	.0000	98	Results are invariant to *NE* when there is no error
MM	.0000	126	
CM	.0000	92	
STAR	.0000	62	
KSU	.0000	70	
KSUF	.0000	71	
KR	.0000	92	
DUS	.0000	150	

Panel B: E_T = 2 Percent

	NE[b] = 1		*NE* = 3		*NE* = 6		*NE* = 12	
ARP	DR*	N	DR*	N	DR*	N	DR*	N
AM	.1470*	118	.1470*	118	.1470*	118	.1470*	118
MM	.0028†	129	.0039†	131	.0060†	133	.0052†	135
CM	.1170*	108	.1181*	109	.1202*	111	.1194*	112
STAR	.0000†	70	.0063†	74	.0032†	71	.0069†	69
KSU	.0125†	62	.0219†	69	.0484	71	.0271†	74
KSUF	.0000†	65	.0152†	70	.0383†	72	.0202†	74
KR	.0007†	93	.0014†	102	.0009†	104	.0009†	105
DUS	.0483	150	.0483	150	.0483	150	.0483	150

Panel C: E_T = 4 Percent

	NE = 1		*NE* = 3		*NE* = 6		*NE* = 12	
ARP	DR*	N	DR*	N	DR*	N	DR*	N
AM	.0257	141	.0257	141	.0257	141	.0257	141
MM	.0011†	129	.0016†	132	.0021†	136	.0031†	141
CM	.0123†	124	.0127†	126	.0132†	130	.0141†	134
STAR	.0002†	72	.0018†	84	.0049†	84	.0121†	80
KSU	.0079†	66	.0108†	78	.0165	79	.0222	85
KSUF	.0002†	67	.0034†	80	.0122†	79	.0189	86
KR	.0004†	87	.0011†	101	.0028†	112	.0036†	118
DUS	.0159	150	.0159	150	.0159	150	.0159	150

* Detection risk exceeds acceptable level of 5 percent
† Detection risk is less than *DUS* alone
[a] See definitions on Table 2
[b] See definitions on Table 2

spective sample sizes. STAR and KSUF consistently had the smallest samples while AM had the largest.

When E_T is set at two percent (Panel B, all tables), which is exactly equal to materiality, sample sizes for AM, MM, CM, and STAR all increased relative to E_T=0. For KSU, KSUF, and KR, sam-

TABLE 5

AVERAGE SAMPLE SIZE (N) AND ACHIEVED DETECTION RISK (DR^*) FOR ANALYTICAL REVIEW RISK = 5 PERCENT
LOW VARIANCE ENVIRONMENT ($PHI = .25$)
$M = 2$ PERCENT

Panel A: $E_T = 0$ Percent

ARP[a]	DR*	N	
AM	.0000	87	
MM	.0000	133	
CM	.0000	83	
STAR	.0000	28	Results are invariant to *NE* when there is no error
KSU	.0000	40	
KSUF	.0000	41	
KR	.0000	71	
DUS	.0000	150	

Panel B: $E_T = 2$ Percent

	NE[b]$=1$		$NE=3$		$NE=6$		$NE=12$	
ARP	DR*	N	DR*	N	DR*	N	DR*	N
AM	.2006*	126	.2006*	126	.2006*	126	.2006*	126
MM	.0192†	135	.0273†	136	.0243†	137	.0336†	140
CM	.1764*	116	.1808*	118	.1823*	119	.1863*	121
STAR	.0209†	39	.0838*	46	.1581*	45	.2356*	44
KSU	.0154†	20	.0875*	39	.1645*	46	.2321*	51
KSUF	.0173†	22	.0911*	39	.1681*	47	.2459*	51
KR	.0194†	69	.0494	82	.0942*	86	.1305*	88
DUS	.0483	150	.0483	150	.0483	150	.0483	150

Panel C: $E_T = 4$ Percent

	$NE=1$		$NE=3$		$NE=6$		$NE=12$	
ARP	DR*	N	DR*	N	DR*	N	DR*	N
AM	.0356	147	.0356	147	.0356	147	.0356	147
MM	.0069†	134	.0057†	137	.0050†	140	.0047†	144
CM	.0267	132	.0251	135	.0248	137	.0244	142
STAR	.0069†	40	.0160	59	.0882*	64	.2308*	61
KSU	.0067†	25	.0356	45	.2349*	46	.3642*	58
KSUF	.0069†	25	.0397	45	.2422*	46	.3733*	58
KR	.0069†	64	.0164	86	.0380	102	.0665*	110
DUS	.0159	150	.0159	150	.0159	150	.0159	150

* Detection risk exceeds acceptable level of 5 percent
† Detection risk is less than *DUS* alone
[a] See definitions on Table 2
[b] See definitions on Table 2

ple sizes increased or decreased depending on the error seeding pattern. KSU and KSUF in Panel B had larger samples than Panel A only if *NE* was six or 12 while KR had a larger sample if *NE* was three, six, or 12.

At $E_T = 2$ percent, achieved detection risk (DR^*) was positive for virtually all

ARPs (a few exceptions occurred if error is concentrated—$NE=1$) and positive (4.83 percent) for *DUS* alone. At this error level, the potential trade-off of audit effort (sample size) and audit effectiveness (detection risk) is most apparent and the relative dominance of STAR and KSUF is observable. That is, in some of the ARPs, the reduction of sample size in comparison to *DUS* alone was accompanied by an increase in detection risk. For STAR and KSUF, however, their smaller sample sizes did not result in a loss of audit effectiveness. Sampling plans which incorporate these ARPs can be more effective than tests of details alone, thus providing a measurable improvement in audit effectiveness.

At $E_T=4$ percent (Panel C, all tables), the pattern of sample size increases was repeated. That is, AM, MM, CM, and STAR tended to increase while KSU, KSUF, and KR either increased or decreased depending on *NE*. DR^* for most ARPs *decreased* at $E_T=4$ percent relative to $E_T=2$ percent level. In spite of the higher level of seeded error, detection risk was disproportionately reduced for many ARPs given the slight increase in sample sizes. For a just-equal-to material error, ARPs generate more incorrect signals (e.g., Type I or Type II errors) and the selection of sample items will not be as heavily concentrated in the erroneous months. As the error level increases, all ARPs become more discriminatory. Risk reduction is achieved via concentration of sample selection in the erroneous months.

Error Seeding[13]

The error seeding pattern had the most impact on the sample sizes for KSU, KSUF, and KR, all of which exhibited significant increases in sample size as error is dispersed (*NE* increased). Samples for MM, CM, and STAR were relatively invariant to the error seeding pattern. The potential variability in sample sizes for some ARPs was reduced because all months were sampled for detail testing, regardless of the outcome of analytical review, as long as the planned risk level for an ARP was greater than five percent (i.e., $AR=36$ percent, 25 percent, 14 percent). Under these conditions, classification errors in the ARP would be partially offset through the detail testing procedure. For $AR=5$ percent, however, no sampling was performed in the months that did not show an analytical review deviation and sample sizes were more sensitive to ARP classification errors. For example, KSU, KSUF, and STAR were less sensitive to changes in *NE* when $AR=36$ percent than when $AR=5$ percent.

All ARPs (except AM which ignores monthly deviations) were most effective when $NE=1$ and usually had detection risk less than *DUS* alone. The superiority of the ARPs, except CM and occasionally STAR, continued for more dispersed seeding patterns ($NE=3$, 6, 12) even though they did exhibit increasing risk. The detection risk for KSUF and STAR seemed to be most sensitive to changes in *NE* (e.g., KSUF increased from 0.1 percent to 2.21 percent and STAR increased from 0.1 percent to 2.55 percent in Panel B, Table 2).

An exception to the steady increase in DR^* often occurred when *NE* increased from six to 12. Here, the detection risk for many ARPs actually decreased in spite of the dispersed error seeding pattern. This decrease in risk may be related to the nature of classification errors that may occur in using the ARPs. For $NE=12$, all months contain errors and therefore, expansion of the sample size in any month will reduce DR^*. This explanation is supported by considering the results when $AR=5$ percent (Table 5). Achieved detection risk at $NE=12$ increased substantially when compared to $NE=6$ for almost all ARPs since, at this risk level, there was no chance for *DUS* to counterbalance a classification error from analytical review.

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[13] The performance of AM did not depend upon the seeding pattern since this procedure did not utilize individual audit period monthly balances.

ARP Risk Levels

Analytical review procedures based on regression analysis incorporate the risk level (AR) directly in the investigation decision rule. As a result, an interaction is expected between the investigation rule and the computation of N_T using (1.4). Lower AR increases the likelihood that an ARP signals possible error that would lead to larger sample sizes. At the same time, however, if no error is signaled, reliance on analytical review is increased, reliance on *DUS* is decreased and sample sizes are smaller. These two effects are partially offsetting so the average sample size for the ARPs may either decrease or increase as AR is varied.

In general, sample sizes increased as the planned risk for analytical review increased. Increases were most extreme for KSU, KSUF, and STAR and least extreme for AM, MM, and CM. For example, Panel A in Tables 2 and 5 indicates that sample sizes for KSUF increased from 41 ($AR=5$ percent) to 105 ($AR=36$ percent). Similarly, STAR increased from 28 to 101. In contrast, CM only increased from 83 to 109 and AM from 87 to 113. MM actually decreased from 133 to 125.

Achieved detection risk for all ARPs tended to increase as AR decreased with the lowest risk occurring at $AR=36$ percent. This result was not consistent across all conditions, however. To the extent that DR^* is minimized at $AR=36$ percent, greater reliance (lower planned risk) on an ARP increases the risk that the combined audit strategy will not detect a material error. STAR was the only ARP which did not conform to this pattern since its lowest risk level was often attained at $AR=14$ percent.

Most ARPs (except AM and CM), had $DR^*<5$ percent as long as analytical review was not relied upon entirely (i.e., as long as $AR>5$ percent). Furthermore, most ARPs were more effective than *DUS* alone for $AR>5$ percent. At $AR=5$ percent, however, not only were the ARPs inferior to *DUS* alone, but DR^* was often in excess of five percent. Additionally, at $AR=5$ percent ARPs' performance deteriorated drastically for the more dispersed error seeding patterns (e.g., $NE=12$). Only MM continued to be generally effective if planned risk was five percent.

Effect of Audit Conditions

In order to examine the ARPs under different conditions, two levels of variability were tested by specifying *PHI* as either high (.75, large standard error) or low (.25, small standard error). Results for $PHI=.25$ were reported in Tables 2 through 5. For comparison purposes, results for $PHI=.75$ are presented in Table 6 for a planned risk level of 36 percent.

Comparing Table 2 to Table 6 indicates that the larger value for *PHI* yields consistently larger sample sizes and higher detection risks for all ARPs. The key exception to this pattern is STAR which actually had lower detection risk at a two percent error level for $NE>1$ (Panel B, Table 6). Another interesting exception occurred for many ARPs if the error level was four percent and widely distributed ($NE=6$ or 12, Panel C). In these cases, the larger standard error resulted in smaller sample sizes (but higher

TABLE 6

AVERAGE SAMPLE SIZE (N) AND ACHIEVED DETECTION RISK (DR^*)
FOR ANALYTICAL REVIEW RISK = 36 PERCENT
HIGH VARIANCE ENVIRONMENT ($PHI = .75$)
$M = 2$ PERCENT

Panel A: $E_T = 0$ Percent

ARP[a]	DR*	N
AM	.0000	122
MM	.0000	131
CM	.0000	117
STAR	.0000	109
KSU	.0000	108
KSUF	.0000	109
KR	.0000	122
DUS	.0000	150

Panel B: $E_T = 2$ Percent

	NE[b]=1		*NE*=3		*NE*=6		*NE*=12	
ARP	DR*	N	DR*	N	DR*	N	DR*	N
AM	.0892	126	.0892	126	.0892	126	.0892	126
MM	.0007	133	.0013	133	.0009	133	.0005	133
CM	.0643	120	.0649	120	.0645	120	.0641	120
STAR	.0064	112	.0087	111	.0065	111	.0081	111
KSU	.0428	109	.0496	108	.0400	108	.0382	110
KSUF	.0338	110	.0394	109	.0334	109	.0341	110
KR	.0007	124	.0004	124	.0009	125	.0005	125
DUS	.0483	150	.0483	150	.0483	150	.0483	150

Panel C: $E_T = 4$ Percent

	NE=1		*NE*=3		*NE*=6		*NE*=12	
ARP	DR*	N	DR*	N	DR*	N	DR*	N
AM	.0448	130	.0448	130	.0448	130	.0448	130
MM	.0005	133	.0016	135	.0022	135	.0022	135
CM	.0355	123	.0360	124	.0363	124	.0362	124
STAR	.0010	114	.0051	114	.0052	113	.0053	113
KSU	.0228	106	.0173	110	.0152	109	.0145	110
KSUF	.0074	108	.0155	110	.0132	109	.0128	111
KR	.0005	124	.0024	127	.0027	126	.0034	127
DUS	.0159	150	.0159	150	.0159	150	.0159	150

[a] See definitions on Table 2
[b] See definitions on Table 2

detection risk as seen before). The existence of large, widely distributed error may reduce the diagnostic power of the ARPs to such an extent that seeded errors are hidden by large random variations in the monthly data.

IV. DISCUSSION, CONCLUSIONS, AND LIMITATIONS

The absolute performance of all ARPs was influenced by the environmental variance, although the relative rankings of procedures did not change much as conditions changed. For example, all ARPs were most effective when the data simulated large nonrecurring errors rather than small, frequent errors that were material. Also, ARPs were most effective when the standard error was small.

Three general conclusions can be drawn based on the simulation results given the assumptions made about the audit process and the environmental conditions that were tested. First, analytical review is clearly a valid strategy for increasing not only audit efficiency (via smaller sample sizes for detail testing), but also for increasing overall audit effectiveness relative to detail testing alone. Not all ARPs decreased both sample sizes and detection risk in all cases but many (notably STAR and KSUF) dominated a non-ARP approach under a wide range of conditions. Furthermore, most of the other ARPs exhibited only a small, but still acceptable, increase in detection risk in spite of reductions in sample size (KR and MM).

The second overall conclusion is that the use of monthly ARPs (rather than AM or *DUS* alone) can increase audit effectiveness. Although MM, KSU, KSUF, KR, and STAR had sample sizes smaller than AM, they invariably had lower detection risks. The superior performance of the ARPs which used monthly data was due to the error distribution and its interaction with the ARPs. For AM, the sample selection was equally distributed across all items in the account (regardless of month). Consequently, an error-free transaction from a month with no error was as likely to be chosen as an erroneous transaction from a month that contained errors. In contrast, the other ARPs concentrated the sample selection in months that contained discrepancies. The probability of selecting erroneous transactions was thus increased due to the diagnosticity of the monthly ARPs. Given the same sample size, the models which use monthly data will concentrate more of the sample in months which actually contain errors and will be more effective than the ARPs which only consider annual balances. The advantage in practice may decrease if measurement error exists in monthly data which would increase the prediction error of the expectation models.

Third, the achieved detection risk of most ARPs was particularly sensitive to the degree of reliance on analytical review. This factor is controllable by the auditor. The evidence presented in this paper suggests that some reliance on analytical review (say *AR* greater than five percent) can increase the effectiveness of an audit strategy relative to total reliance on tests of details. The gain in effectiveness occurs because the auditor is able to direct sample selection to areas (e.g., months) where errors were most likely to occur.

These results present a different picture of analytical review performance than that of prior studies which only examined the incidence of Type I and Type II errors without considering the performance of an overall audit strategy. Logically, one might expect that more Type I errors from analytical review would lead to larger sample sizes and unnecessary audit effort while frequent Type II errors would lead to higher detection risk due to inadequate sampling. Knechel [1986] reported that MM and AM had low Type II error rates and STAR had a relatively high Type II error rate. Kinney and Salamon [1982] also reported that STAR had a high Type II error rate and that KR had a low Type II error rate.

The results in the present study are only consistent for MM and KR since their low Type II error rate in previous studies is consistent with their low detection risk in this study. AM had a relatively high detection risk in this study in spite of its high Type I error rate and STAR had a low detection risk in this study in spite of its high Type II error rate. Clearly, the incidence of Type I and Type II errors is not the only indication of the effectiveness of analytical review and the overall audit strategy should be considered when evaluating alternative audit procedures.

The results reported in this study should be interpreted with three limitations in mind. First, the analysis was based on the assumption that the data used in the estimation model was error-free and the regression model was well-fitted. This assumption may not be realistic if unaudited internal monthly data is used.

Second, as previously noted, the followup use of *DUS* was conservatively represented in the simulation. To the extent that auditors utilize other testing procedures or rely on uncorroborated explanations of discrepancies, achieved detection risk may be increased and may exceed the five percent planned level or the level for *DUS* alone.

Finally, the size and nature of an unexplained deviation in analytical review is information that is potentially useful to an auditor. In actual audit settings, the extent of detail testing may be a function of the size of the ARP deviation as well as the deviation's existence. Only the KR rule explicitly considers the size of the monthly deviations when determining which months to investigate. Explicit consideration of deviation size when determining the extent of followup testing may significantly change relative rankings of the ARPs' efficiency and effectiveness.

APPENDIX

COMPUTATION OF ACHIEVED DETECTION RISK (*DR**): POST-AUDIT UNDISCOVERED ERROR AND RISK OF MATERIAL ERROR

Step 1: Compute the sample size

—use formula (1.4) with specific values of TD and M

Step 2: Compute the error frequency for DUS

—assume that all errors are 100 percent overstatements
—for annual ARPs: $p=E_T/X_T$
—for monthly ARPs: $p=e_t/x_t$

Step 3: Compute DR*

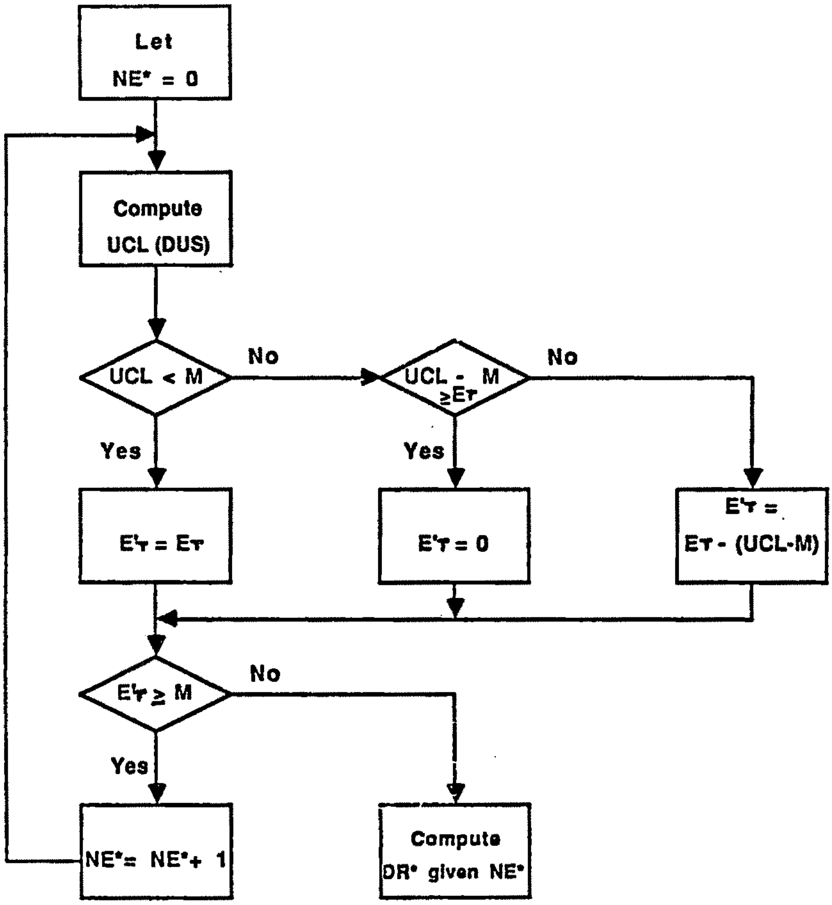
—follow the iterative procedure in Figure 1
—The following formula is used to compute UCL

$$UCL=\left(\frac{X_T}{N_T}\right)\cdot UDR(NE^*, TD)$$

—$DR^* = \text{Prob}\{\text{Number of discovered errors} < NE^* \mid N_T, p\}$

FIGURE 1

ITERATIVE PROCEDURE FOR COMPUTING ACHIEVED DETECTION RISK (DR^*)



AN EXAMPLE

(1) Assumed data: $X_T = \$100{,}000$
$M = 2{,}000$ (2%)
$E_T = 4{,}000$ (4%)
$NE = 6$ (months containing error)
$AR = .25$

(2) Computed results:

$$TD = DR/AR = .05/.25 = .20$$
$$UDR(0, .20) = 1.61$$
$$N_T = (1.61)\,(100{,}000)/2{,}000 = 81$$
$$p = 4{,}000/100{,}000 = .04$$

(3) Compute DR^* using iterative procedure:

Pass 1: No errors in sample

$$UCL=(100{,}000/81)\ (1.61)=1{,}988$$
$$\text{Adjustment}=0$$
$$E'_T=4{,}000 \text{ (exceeds } M)$$

Pass 2: 1 error in sample

$$UCL=(100{,}000/81)\ (3.00)=3{,}704$$
$$\text{Adjustment}=1{,}704$$
$$E'_T=2{,}296 \text{ (exceeds } M)$$

Pass 3: 2 errors in sample

$$UCL=(100{,}000/81)\ (4.28)=5{,}284$$
$$\text{Adjustment}=3{,}284$$
$$E'_T=716 \text{ (which is less than } M).$$

Therefore

$$NE^*=2$$
$$DR^*=\binom{81}{0}\cdot(.04)^0\cdot(.96)^{81}+\binom{81}{1}\cdot(.04)^1\cdot(.96)^{80}=.1603.$$

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NOTES

Discretionary Accounting Changes from "Successful Efforts" to "Full Cost" Methods: 1970-76

W. Bruce Johnson and Ramachandran Ramanan

ABSTRACT: This note extends previous research on accounting method choice in the petroleum industry by examining the association between selected attributes of "successful efforts" firms and the decision to change to "full cost" accounting. Firms that changed to full cost are found to exhibit higher levels of financial risk (leverage) and exploration activity (capital expenditures) when compared to firms that retained successful efforts, and these differences are shown to *predate* full cost adoption by several years. Tests also indicate that the change to full cost is associated with concurrent increases in debt financing and exploration investment.

PRIOR research on the differential use of "successful efforts" (*SE*) and "full cost" (*FC*) accounting by oil and gas companies has shown that *FC* firms tend to be smaller, more highly levered, and more aggressive in their exploration activities than are their *SE* counterparts [Deakin, 1979; Dhaliwal, 1980; Foster, 1980; and Lilien and Pastena, 1982]. These findings have been interpreted as indicating that firm size, leverage, and exploration intensity (or risk) are partial determinants of accounting method choice in the petroleum industry. Yet, the available evidence derives solely from studies employing static *ex post* research designs where selected attributes of *FC* firms are compared to those of *SE* firms, with the analysis restricted to observations for a single year (typically 1976).[1] A limiting feature of studies using this approach is that they neglect to test whether ob-

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W. Bruce Johnson is at the Kellogg Graduate School of Management, Northwestern University, and Ramachandran Ramanan is at the Graduate School of Business Administration, University of North Carolina at Chapel Hill.

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served attribute differences predate the accounting choices under investigation.

Consider, for example, the well documented finding that *FC* firms tend to be more highly levered (in 1976) than are *SE* firms. This result is generally regarded as consistent with the notion that *FC* adoption occurs in response to an increased probability of debt covenant violation. This interpretation of the data would be called into question if systematic differences in leverage (a proxy for the probability of technical default) were found to exist several years prior to *FC* adoption, i.e., when both (eventual) *FC* and *SE* firms used similar accounting procedures. Evidence indicating that leverage differences predate *FC* adoption would suggest the possibility that other considerations, including factors unrelated to leverage and technical default, may have been important determinants of firms' accounting choices.

This note extends previous research on the determinants of the *SE/FC* choice by comparing selected attributes of firms that *changed* from *SE* to *FC* between 1970 and 1976 to those of firms that *retained* the *SE* method throughout the seven-year period.[2] Firms that changed accounting procedures exhibit higher levels of financial risk (leverage) and exploration activity (capital expenditures) in the year of *FC* adoption when compared to firms that retained the *SE* method. However, systematic differences in these firm characteristics are also documented several years prior to the change in accounting methods. This result raises a rather puzzling question: Why didn't *FC* adopting firms change accounting methods earlier? The question is addressed by comparing rates of growth in debt financing and capital expenditures around *FC* adoption to firms' historical growth rates and to contemporaneous growth rates for *SE* firms.

SAMPLE SELECTION AND SAMPLE CHARACTERISTICS

The essential features and conceptual merits of full cost and successful efforts accounting have been widely discussed in the literature [Klingstedt, 1970; FASB, 1977; SEC, 1978a and 1978b; and Lilien and Pastena, 1981]. Briefly, *FC* accounting capitalizes all costs incurred in prospecting for oil and gas reserves and in acquiring, exploring, and developing oil and gas properties. Capitalization is not dependent on successful drilling, and capitalized costs are amortized over relatively large cost centers as resources are depleted. In contrast, *SE* accounting capitalizes only those acquisition, exploration, and development costs associated with successful discovery of oil and gas deposits. The costs of unsuccessful drillings are expensed in the period of exploration.

Oil and gas exploration companies relied exclusively on successful efforts accounting prior to 1959. The first doc-

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[1] More precisely, these studies have employed "static-group comparison" designs [Campbell and Stanley, 1966] in which attributes of *FC* and *SE* firms are compared as follows:

FC firms: $x \bullet \bullet \bullet \bullet\ ,\ ,\ \bullet\ 0_1$
SE firms: $\bullet \bullet \bullet \bullet\ ,\ ,\ \bullet\ 0_2$

where x denotes adoption of *FC* accounting, 0_1 and 0_2 denote subsequent observations of the attribute(s) of interest to the researcher, and each • represents an accounting period (fiscal year). Systematic differences between 0_1 and 0_2 may reflect the impact of events occurring before, after, or concurrent with adoption of *FC* accounting (the x); hence, causal interpretation of an 0_1-0_2 difference becomes problematic unless one is willing to assume that the attribute under examination is characterized by an extraordinary degree of cross-temporal stationarity.

[2] The current study employs a "nonequivalent control group" design [Campbell and Stanley, 1966] illustrated by:

SE-to-*FC* firms: $0_1 \times 0_3$
SE firms: $0_2\quad 0_4$

where 0_1 and 0_2 denote observations of the attribute(s) of interest prior to the accounting change (the x), while 0_3 and 0_4 denote subsequent attribute observations.

umented use of the full cost method occurred with publication of the 1959 *Annual Report* of Belco Petroleum Company [Deakin, 1980]. By 1970, *FC* accounting had gained widespread acceptance and was being used by roughly 40 percent of the industry [Patz and Boatsman, 1972; Lilien and Pastena, 1982]. Early changes from *SE* to *FC* accounting were concentrated in 1963 and 1964 [Klingstedt, 1970], and frequently involved firms that were experiencing adverse economic conditions (e.g., debt agreement noncompliance) [Deakin, 1980].

Insights about the financial statement impact of *FC* and *SE* accounting have been provided by several studies. Sunder [1976] presents mathematical expressions for the effects of *SE* and *FC* accounting on earnings and assets (the capitalized value of exploration costs) under various assumptions about firm growth. In periods of increased exploration activity (or exploration risk), *FC* accounting leads to higher earnings levels, lower earnings variance, and more favorable return-on-assets and debt-equity ratios than does *SE* accounting. A study of 36 *FC* companies by Touche Ross & Co. in March 1977 tends to corroborate these predictions. This survey showed that a forced change from *FC* to *SE* would (on average) reduce reported earnings by 20 percent, reduce the carrying values of oil and gas properties by 30 percent, reduce shareholders' equity by 16 percent, and cause nine firms (25 percent of the respondents) to default on existing debt agreements.[3]

Sample Selection

The current study is restricted to an analysis of *SE/FC* accounting changes made during the seven-year period from 1970 through 1976. Although a number of *SE/FC* accounting changes occurred in the early 1960's, systematic investigation of these events was precluded by the lack of sufficient primary data sources (annual reports and 10-K filings). Accounting changes subsequent to 1976 were not examined because they are potentially confounded by SEC regulatory initiatives.[4]

An initial pool of 88 *FC* and 80 *SE* firms, categorized according to the accounting method used in fiscal 1977, was assembled from prior published samples [Deakin, 1979; Collins and Dent, 1979; Dyckman and Smith, 1979; and Lev, 1979]. Thirty instances of discretionary *FC* adoption were identified by examining the annual reports or 10-K filings of the 88 *FC* firms for 1970 through 1976. Eleven firms adopted *FC* in conjunction with incorporation or initial entry into oil and gas exploration, and these firms were subsequently excluded from the analysis. The remaining 19 cases involved firms that switched from *SE* to *FC* accounting. These firms comprise the *change group* for the study.

Of the preliminary pool of 80 firms that used *SE* in 1977, 23 firms were excluded because they were major integrated exploration, refining, and distribution companies (e.g., Atlantic Richfield, Exxon, and Mobil Oil).[5] The annual reports and 10-K filings of the remaining 57 firms were examined to identify instances of voluntary changes from *FC* to *SE* accounting between 1970 and 1976. Two firms that switched from *FC* to *SE* in 1977 were identified and deleted from the sample. The remaining 55 *SE* firms comprise the *control group* for the study, although the exact number of control firms retained in the analysis varies because of data availability limitations.

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[3] Letter dated March 29, 1977 from Touche Ross & Co. to the Ad Hoc Committee on Full Cost Accounting [as reported in Collins and Dent, 1979 and Dyckman and Smith, 1979].

[4] The Energy Policy and Conservation Act of 1975 ordered the SEC to develop a uniform method of oil and gas accounting in consultation with the FASB. The FASB proposed the elimination of *FC* accounting [FASB, 1977], was overruled by the SEC, and companies were permitted to continue using either *FC* or *SE* methods in primary financial statements [SEC, 1978a and 1978b]. The events surrounding this regulatory debate are chronicled in Foster [1980].

[5] The decision to exclude major integrated oil and gas companies was motivated by a desire to restrict the analysis to firms where exploration and development activities (i.e., drilling) are a principal source of operating revenues.

Sample Characteristics

Descriptive statistics on the financial statement impact of *FC* adoption for the 19 *SE/FC* firms are presented in Table 1. The company name and year of adoption are indicated in columns 1 and 2.[6] Columns 3 through 6 report the adoption-year impact of the accounting change on reported earnings, retained earnings, common equity, and total asset book values (respectively) for each firm. The final column in Table 1 presents excerpts from managements' discussion of the accounting change.

The change from *SE* to *FC* accounting had a dramatic impact on the financial statements of some companies. For example, *FC* adoption enabled Flying Diamond Oil to increase its reported earnings by 215 percent and to materially increase retained earnings, common equity, and total asset book values. On the other hand, *FC* adoption had minimal impact on the financial statements of Pioneer Corporation: reported earnings increased by one percent while retained earnings, common equity, and total asset book values increased less than 0.5 percent. Argonaut Energy and Cayman Corporation avoided reporting adoption-year losses by changing to *FC* accounting, and Delhi International Oil significantly reduced its reported loss by switching methods. Five firms reduced deficit retained earnings positions as a result of the accounting change.

Seven *SE/FC* firms (36.8 percent of the sample) were classified as public utilities by *Moody's*, and six of those companies were under FPC jurisdiction during the time period covered by the study. Houston Natural Gas and Southern Union Gas changed to *FC* accounting in 1970, two other companies (Ensearch and Entex) adopted *FC* in 1971, and the remaining three utilities (Missouri Pacific, Panhandle Eastern, and Pioneer) changed accounting methods in 1973. For these firms, the decision to change accounting methods may have been partially motivated by the 1971 Federal Power Commission (FPC) ruling mandating the use of *FC* accounting for regulatory purposes by companies under its jurisdiction.[7] However, FPC compliance may not have been the sole reason why these firms changed to *FC* accounting because (i) only one firm (Ensearch) cited FPC compliance as a reason for adoption; (ii) three firms adopted *FC* accounting for shareholders' reports in 1973, nearly two years after

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[6] Firms typically do not announce the change to *FC* accounting in advance of releasing the annual report or 10-K. Consequently, the annual report date was used as a basis for determining the adoption year: firms with a fiscal year ending between January 1 and June 30 (July 1 and December 31) were classified as having changed accounting methods in the previous (current) calendar year. Identical data realignment procedures were applied to the control group sample.

[7] In October, 1970, the Federal Power Commission (FPC) gave notice of its intent to require *FC* accounting for exploration, acquisition and development costs incurred by regulated natural gas pipeline companies and pipeline affiliates on leases acquired on or after October 7, 1969. On November 15, 1971, the FPC required *immediate* adoption of *FC* accounting by companies under its jurisdiction (Order No. 440). Petitions for a rehearing were filed by several parties, but were subsequently denied in January, 1972 [Arthur Andersen, 1972]. The FPC's accounting requirement applied only to financial statements filed for regulatory purposes; companies under FPC jurisdiction continued to have discretion over the accounting method used in shareholder reports.

TABLE 1
OIL AND GAS COMPANIES CHANGING TO THE FULL COST METHOD BETWEEN FISCAL 1970 AND 1976

Company	Year of Adoption	*Percent Impact of* FC *in Year of Adoption*[a] Earnings	Retained Earnings	Common Equity	Assets	Excerpts from Management's Decision
Adobe Oil and Gas	1976	30.2%	−1.8%	−0.7%	4.7%	"greater emphasis being placed on exploratory drilling"
Argonaut Energy	1973	nm	nm	33.7	25.0	no explanation provided
Barnwell Industries	1971	16.8	39.4	8.1	6.9	"increasing importance of exploration activities"
Callon Petroleum	1974	9.1	825.0	3.4	4.0	"provides more meaningful financial statements"
Cayman	1975	nm	nm	nm	7.4	"more clearly reflects operations"
Coquina Oil	1973	25.0	22.6	12.1	9.1	"increasingly committed to exploration drilling"
Delhi International Oil	1970	nm	nm	603.3	36.7	no explanation provided
Ensearch	1971	9.4	2.0	0.7	0.5	"compliance with FPC ruling of 11-5-71"
Entex	1971	1.5	1.3	0.3	0.6	"more properly reflect the economic nature of the business"
Flying Diamond Oil	1974	215.4	97.0	15.4	6.9	adopted concurrently with merger
Helmet Petroleum	1974	177.8	nm	3.0	2.3	"presents results in a more meaningful manner"
Houston Natural Gas	1971	3.1	0.9	0.5	0.2	"expanded oil and gas exploration program"
Houston Oil and Mineral	1971	61.5	163.1	15.6	3.4	no explanation provided
Missouri Pacific	1973	−1.4	2.3	1.1	1.0	"results presented in a more meaningful manner"
North Canadian Oils	1973	27.8	5.8	4.5	4.8	no explanation provided
Panhandle Eastern	1973	14.1	8.0	6.0	3.5	no explanation provided
Pioneer Corp.	1973	1.1	0.3	0.2	0.1	"widespread use . . . better matching"
Southern Union Gas	1970	3.9	6.1	2.7	3.0	no explanation provided
Triton Oil and Gas	1972	23.5	nm	3.1	1.3	adopted concurrently with merger
Median		9.4%	2.0%	3.1%	3.5%	

[a] The impact of *FC* adoption on earnings was computed as $[FC_a/SE_a)-1.0]\times 100$, where FC_a and SE_a denote adoption-year earnings under *FC* and *SE* methods, respectively. The impact of *FC* adoption on beginning Retained Earnings and Common Equity book values, and on year-end Asset book values, were computed in the same manner. The symbol "nm" denotes cases where meaningful percentages could not be computed because of negative denominator values; e.g., Argonaut Energy would have reported an adoption-year loss if the *SE* method had been retained.

the FPC required immediate *FC* adoption; and (iii) three FPC regulated companies (included in the control group) retained *SE* accounting for shareholder reports throughout the period under examination.

Table 2 compares selected characteristics of *SE/FC* firms to those of firms that retained the *SE* method. Median values for total revenue, return on assets, leverage, and capital expenditures per sales dollar are reported along with the proportion of sample firms that reported a loss, made no dividend payment, or had unrestricted retained earnings deficiencies. Panel A presents data for the control group sample (firms that retained the *SE* method) for each year of the 1970–76 period; Panel B presents data for the *SE/FC* group (firms that changed from *SE* to *FC* accounting) for each year of a four-year period beginning two years before the year in which the accounting change occurred. Panel C reports the number of firms in each sample.

Several features of the data in Table 2 are noteworthy. *SE/FC* firms (Panel B) are smaller, less profitable, and more highly levered than are firms that retained *SE* accounting throughout the period (Panel A). At the same time, *SE/FC* firms commit a larger proportion of each sales dollar to capital investment. Roughly one-half of the firms in each sample did not pay cash dividends during the years examined, and a relatively large proportion of firms in both samples faced binding dividend payment constraints. Caution should be exercised in drawing direct inferences from the data in Table 2, however, because Panel A is organized in calendar time while Panel B is organized in event time.

The question then is why did 19 firms voluntarily change from *SE* to *FC* accounting while the 55 control group firms retained the *SE* method? The following excerpt is typical of the justification offered by the firms themselves for the decision to change from *SE* to *FC* accounting:

> The [*FC*] method of accounting for oil and gas properties was adopted because management believes full costing provides more meaningful financial statements since all expenditures, whether productive or nonproductive, are capitalized to measure the company's total investment in its exploratory activities. Moreover, the full cost method results in such capitalized costs being amortized against the revenue obtained from reserves discovered as a result of its total exploratory effort to obtain a proper matching of revenue and cost. [Callon Petroleum, 10-K report, 1975]

While the conceptual merits of *SE* and *FC* accounting may govern the choices of some firms, for many others more practical considerations may dominate. Drawing on earlier findings, the next section of this note investigates the association between the accounting method change and variables previously shown to be correlated with *FC* use.

EMPIRICAL TESTS AND RESULTS

Studies by Deakin [1979], Dhaliwal [1980], Foster [1980], and Lilien and Pastena [1982] document several empirical regularities associated with the differential use of *SE* and *FC* accounting among oil and gas producing companies. *FC* firms are typically smaller, more highly leveraged, and are characterized by higher levels of capital expenditures (as a percent of sales) and lower rates of exploratory drilling success when compared to *SE* firms. These findings are generally interpreted as evidence that preferences for *SE* and *FC* accounting reflect incentives associated with debt covenants that require firms to maintain

TABLE 2
SELECTED SAMPLE CHARACTERISTICS[a]

	Sample Median				Percentage Reporting		
	Revenues ($m)	Return on Assets (Percent)	Leverage (Percent)	Capital Expenditure per Sales Dollar (Percent)	Net Loss	No Dividend Payment	Deficit Dividend Pool
Panel A. Firms remaining on SE							
1970	25.4	5.1	19.2	24.8	11.6	43.6	19.5
1971	26.9	4.8	17.3	22.5	18.8	47.7	25.5
1972	18.4	4.6	20.2	27.4	26.0	47.8	24.5
1973	22.8	6.7	19.7	25.6	15.1	50.0	26.9
1974	37.8	8.5	15.2	30.8	3.6	47.2	20.4
1975	57.1	7.2	19.3	30.8	10.9	45.5	14.5
1976	65.6	7.3	22.4	27.0	3.6	38.2	12.7
Panel B. Firms changing from SE *to* FC							
2 years before *FC* adoption	5.6	4.1	41.2	27.7	27.8	57.9	41.2
1 year before *FC* adoption	4.4	4.5	36.2	35.0	31.6	52.6	36.8
Year of adoption	7.6	5.8	30.0	33.3	5.3	57.9	36.8
1 year after *FC* adoption	7.9	4.5	39.9	43.2	10.5	52.6	36.8

Panel C. Sample size

	1970	*1971*	*1972*	*1973*	*1974*	*1975*	*1976*
SE firms	45	48	51	54	55	55	55
SE/FC firms	2	5	1	6	3	1	1

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[a] Leverage was defined as long-term debt plus preferred stock, divided by tangible assets. Return on assets was defined as net earnings (or loss) divided by the year-end book value of assets. A firm was classified as having a deficit dividend payment pool if either statutory or contractual dividend payment constraints were binding.

prescribed levels of certain key financial variables (e.g., interest coverage and leverage ratios, and unrestricted retained earnings).

Oil and gas companies with aggressive exploration programs experience a relatively high percentage of unsuccessful (dry) wells, thereby creating large pools of prospecting costs subject to either *FC* capitalization or *SE* expensing. As exploration activity (and therefore exploration risk) increases, firms that use *SE* accounting will experience a deterioration in reported profits and retained earnings, and an increase in the variance of earnings [Sunder, 1976]. These effects contribute to an increased likelihood of technical default. This line of argument implies that highly levered oil and gas companies engaged in aggressive exploration use *FC* accounting to partially circumvent the adverse impact of risky drilling activity on debt covenant restrictions. Accordingly, firms that change from *SE* to *FC* accounting are predicted to exhibit systematic differences in size, proximity to covenant restrictions, and exploration intensity when compared to *SE* control firms.[8]

Measurement Issues and Procedures

Firm size (SIZE) was measured as the natural logarithm of total operating revenues. Three variables were used as surrogates for the firm's proximity to restrictive covenants: the ratio of long-term debt and preferred stock to tangible assets (LEVRG); earnings before interest divided by interest expense (COVRG); and cash dividends to common divided by available unrestricted retained earnings (DIV).[9] Two financial measures of exploration activity were used as surrogates for drilling intensity: capital expenditures divided by total operating revenues (CAPX); and revenues from oil and gas activities as a percent of total operating revenues (PCTOG). The requisite data were obtained from annual reports, 10-K filings, and from *Moody's Industrial*, *OTC*, and *Public Utilities* manuals.[10]

Logit analysis was used to evaluate the ability of firm size, debt covenant proximity, and exploration intensity variables to differentiate between change and nonchange sample firms. The dependent variable was assigned a value of zero if the firm was a member of the control (*SE* retaining) sample, and a value of one if the firm was a member of the *SE/FC* sample. Logit provides asymptotically efficient coefficient estimates in situations where the dependent variable of interest is nominal [Maddala, 1977]. The power of the model to correctly classify firms into change and nonchange groups was evaluated by iteratively classifying each of the N firms using model parameter estimates obtained from the data for the remaining $(N-1)$ firms [Mosteller and Tukey, 1977].

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[8] Decreased (or delayed) corporate tax payments, decreased information production costs, and increased management compensation have also been advanced as potential explanations for voluntary changes in accounting methods (see Holthausen and Leftwich [1983]). These hypotheses were not examined in this study because: (i) virtually all oil and gas producing companies used *SE* accounting for tax purposes during the time period covered by this study; (ii) the difference in information production costs (e.g., bookkeeping and auditing) between *FC* and *SE* accounting methods is likely to be inconsequential; and (iii) specific details about the form of management compensation arrangements for sample firms were not readily available.

[9] The level of a firm's leverage (or interest coverage) is an adequate surrogate for the firm's proximity to a covenant constraint if the maximum leverage (minimum coverage) specified in debt agreements is constant across firms. Cross-sectional differences in these constraints introduce measurement error. Special coding rules were invoked to improve the distributional properties of two debt covenant variables (COVRG and DIV) by restricting the maximum value of each variable to 20.0 and 3.0, respectively, and by setting DIV equal to 3.0 when the firm's dividend payment constraint was binding. The proportion of sample firms with binding dividend constraints is reported in Table 2. Truncation of COVRG affected about ten percent of the sample.

[10] Data limitations severely hampered our ability to use nonfinancial measures of covenant proximity and drilling activity. Less than 50 percent of sample firms had public debt outstanding, and details of covenants in private lending agreements were not readily available from standard sources (*Moody's* manuals or firms' annual reports and 10-K filings). Moreover, drilling activity data (e.g., dry wells to total wells drilled) were not systematically disclosed by sample firms over the time period examined.

Because the number of firms changing from *SE* to *FC* accounting in any one year was too small to allow statistically meaningful comparisons in calendar time, the analysis was performed in event time using randomly selected subsamples of control group firms. Each *SE/FC* firm was randomly paired with two *SE* firms (without replacement), and concurrent (calendar time) realizations of the explanatory variables were then recorded for all three firms. This data realignment process generated a subsample consisting of event time observations for 19 *SE/FC* firms and 38 control firms. Five distinct subsamples were constructed in this manner, with the analysis repeated for each subsample as a check on the possibility of subsample-specific results.

Results

Table 3 summarizes results for one of the five subsamples, with the logit model separately estimated for each event year from -2 through $+1$ where year 0 corresponds to the year of *FC* adoption. Note that *FC* realizations (i.e., "as reported" accounting numbers) for *SE/FC* firms were utilized to estimate the logit model in years 0 and $+1$. The logit model was also estimated using "as if *SE*" realizations in year 0 for *FC* adopting firms; however, the results were qualitatively identical to those reported in Table 3.[11] In the interest of brevity, the subsample replication results are not reported.

There are two noteworthy features of the results in Table 3. First, the explanatory power of the logit model in year 0 is relatively high in that 78.2 percent of sample firms are correctly classified according to whether they retained *SE* or changed to *FC* accounting.[12] More importantly, roughly the same proportion of control and change firms were correctly classified by the model. Statistically significant positive coefficients are associated with firm leverage (LEVRG) and exploration intensity (CAPX) variables. Negative coefficient estimates are associated with firm size (SIZE) and dividend constraint (DIV) variables, while interest coverage (COVRG) and oil/gas revenue (PCT) variables exhibit positive coefficient estimates; however, the coefficient estimates for these variables are not statistically different from zero.[13] These results are comparable to those obtained by Lilien and Pastena [1982], who examined attributes associated with firms' 1976 use of *FC* or *SE* methods.

Perhaps the most striking aspect of the

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[11] Restatement of "as reported" *FC* financial data for the current and retroactive effects of *SE* abandonment involved adjustments to earnings, retained earnings, total assets, and deferred income taxes based on information contained in firms' financial statement descriptions of the accounting change.

[12] By comparison, the classification accuracy rate predicted by the "proportional chance" null hypothesis [Joy and Tollefson, 1975] is 54.8 percent.

[13] The logit analysis relies on state-based sampling, an approach that can lead to biased coefficient estimates when sample proportions deviate markedly from population proportions. Our resampling procedure provides a partial check against coefficient bias, and no particular problems were evident in the replication results. In addition, the logit model was estimated using the "weighting" correction described by Zmijewski [1984], and results similar to those in Table 3 were obtained. Moreover, although several variables exhibited a moderate degree of multicollinearity, interpretation of the results in Table 3 was not affected. The logit model was re-estimated excluding the statistically significant explanatory variables (LEVRG and CAPX), and the remaining variables had no explanatory power: individual coefficent estimates were insignificant and correct classification rates were roughly 50 percent for each group.

TABLE 3
LOGIT ANALYSIS OF THE CHANGE TO *FC* ACCOUNTING[a]

	Coefficient Estimate (*t-statistic*)								*Classification Success*		
Year	*Constant*	*SIZE* −	*LEVRG* +	*COVRG* −	*DIV* +	*CAPX* +	*PCTOG* +	*Chi-squared Statistic*	*Overall*	SE/FC *Firms*	*Control Firms*
+1	−2.72 (−1.66)*	−0.03 (−0.16)	6.28 (2.54)*	0.00 (0.05)	0.15 (0.17)	1.24 (0.95)	−0.00 (−0.14)	12.82*	72.2%*	73.7%	71.4%
0	−4.21 (−2.37)*	−0.04 (−0.15)	7.31 (2.31)*	0.01 (0.18)	−1.01 (−0.92)	2.76 (1.84)*	0.01 (0.85)	16.26*	78.2%*	79.0%	77.8%
−1	−3.88 (−2.19)*	−0.08 (−0.36)	5.75 (2.29)*	−0.05 (−0.81)	−0.87 (−0.85)	2.39 (1.66)*	0.02 (1.24)	14.92*	72.2%*	73.7%	71.4%
−2	−2.93 (−1.65)	−0.16 (−0.66)	5.82 (2.03)*	−0.03 (−0.44)	0.76 (0.76)	0.89 (0.75)	0.01 (0.56)	15.93*	72.0%*	70.6%	72.7%

[a] The dependent variable=1 for *SE/FC* firms; =0 for *SE* firms; SIZE=natural logrithm of total operating revenue; LEVRG=long-term debt plus preferred stock, divided by the book value of tangible assets; COVRG=net income before interest expense, divided by interest expense; DIV=cash dividends to common shareholders divided by available unrestricted retained earnings; CAPX=capital expenditures divided by total operating revenue; and PCTOG =revenue attributed to oil and gas activities as a percent of total operating revenue. Classification proportions are based on iterative procedures (jackknifing) with prior probabilities equal to the sample frequencies.

* Denotes statistical significance at the ten percent level or less. The chi-squared statistic provides a joint test of the null hypothesis that the logit coefficients are equal to zero. The statistical significance of full-sample (jackknifed) classification rates was assessed using a binomial test with proportionate prior probabilities.

results in Table 3 is the logit model's ability to distinguish between control and change firms *before FC* adoption. For example, 72.2 percent of the sample firms are correctly classified by the logit model in year −1, with both control and (eventual) change firms exhibiting similar levels of correct classification. The coefficient estimates for LEVRG and CAPX are again statistically significant and positive, while the coefficient estimates associated with the remaining explanatory variables are not statistically different from zero. Similar results are found in year −2 except that the positive coefficient for CAPX is no longer statistically significant.[14]

In summary, oil and gas companies that changed from *SE* to *FC* accounting were characterized by higher levels of debt financing (LEVRG) and capital expenditures per sales dollar (CAPX) in the year of *and the two years preceding FC* adoption when compared to firms that retained the *SE* method. None of the remaining explanatory variables exhibited a statistically significant association with the change in accounting methods. The systematic exclusion of large, integrated oil and gas producing companies from *SE* control group undoubtedly contributed to the absence of a significant firm SIZE coefficient. Moreover, the inability of the dividend constraint variable (DIV) to differentiate *SE/FC* and control firms is not surprising given that less than 50 percent of sample firms paid cash dividends during the time period under examination (see Table 2).[15]

The cross-temporal stability of the Table 3 results is quite surprising given that the demand for *FC* accounting by change firms increased between year −2 and the adoption year and that the variables examined here (and in prior studies) represent surrogates for *FC* accounting demand. Apparently, the two sample groups are characterized by relatively permanent differences in covenant proximity and drilling intensity because the logit model exhibits little deterioration in explanatory power when estimated over periods where both groups employ *SE* accounting.

To provide insights about the *timing* of *FC* adoption decisions, annualized rates of growth in total debt financing (DEBT), leverage (LEVRG), capital expenditures (EXPND), and capital expenditures per sales dollar (CAPX) were computed for each sample firm over a two-year adoption period (corresponding to years 0 and +1) and a pre-adoption base period (corresponding to years −1 through −5).[16] Consistent with Sunder's [1976] analysis, firms that changed to *FC* accounting are predicted to exhibit significant increases in capital expenditures and debt financing during the adoption period when compared to (i) their historical (base-period) growth rates and (ii) contemporaneous growth rates for *SE* firms.

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[14] To provide further control over possible cross-temporal differences in the levels of the explanatory variables, the logit model was also estimated using mean-deflated values of the explanatory variables; i.e., observed values were divided by the corresponding (calendar time) control group sample mean. The results were qualitatively identical to those reported in Table 3.

[15] Several additional tests were performed to assess the sensitivity to the special coding rules used for COVRG and DIV variables. Parametric and nonparametric procedures were used to test the null hypothesis that the observed values of each variable were randomly distributed within the *SE* firm population. These univariate test results generally support the findings in Table 3 except that significant differences in firm SIZE and COVRG were detected for the two years preceding the change in accounting methods. Details regarding test construction and results are available from the authors.

[16] Relative growth rates for each firm and variable were defined (subject to data availability) as $G_2 - G_1$ where G_1 denotes the continuously compounded annual rate of change for the two-year period following *FC* adoption (years 0 and +1), and G_1 is the base-period growth rate similarly defined over years −5 to −1.

TABLE 4

ANALYSIS OF RELATIVE GROWTH IN CAPITAL EXPENDITURES AND DEBT FINANCING[a]

	DEBT	*LEVRG*	*EXPND*	*CAPX*
A. Firms changing to FC				
Median relative growth	0.149	0.017	0.191	0.036
Proportion positive[b]	0.632*	0.579	0.737*	0.526
Wilcoxon *p*-value[c]	0.061	0.162	0.061	0.603
B. Firms retaining SE				
Median relative growth	−0.018	−0.058	0.130	0.018
Proportion positive	0.473	0.447	0.605*	0.526
Wilcoxon *p*-value	0.613	0.738	0.083	0.680
C. Between-sample comparison				
Mann-Whitney *p*-value	0.062	0.082	0.263	0.642

[a] The individual variables were defined as follows: total current and long-term debt (DEBT); long-term debt plus preferred stock, divided by tangible assets (LEVRG); capital expenditures (EXPND); and capital expenditures per sales dollar (CAPX). Asset book values were restated (where appropriate) to eliminate the confounding effects of change to *FC* accounting. Relative growth rates were computed for each variable and firm by subtracting the annualized historical (base period) growth rate from the adoption-period (years 0 and +1) annualized growth rate (see footnote 16).

[b] Proportion positive denotes, for each attribute, the percentage of sample firms with adoption-period growth rates that exceed the firm's historical (base period) growth rate. A * denotes statistical significance at the ten percent level or less (binomial test with 0.50 prior probability).

[c] The Wilcoxon procedure provides a nonparametric test of the null hypothesis that the median relative growth rate is positive, and thus provides a within-sample comparison of adoption-period and historical growth rates. The Mann-Whitney procedure provides a nonparametric test of the null hypothesis that the median (contemporaneous) relative growth rate for *FC*-adopting firms exceeds the median for *SE* firms. *P*-values are one-tailed significance levels for the nonparametric tests.

The results of this analysis are summarized in Table 4. Panel A compares adoption period growth in capital expenditures and debt financing of *SE/FC* firms to the base period growth experienced by those same firms. For the median *FC*-adopting firm, total debt increased by 14.9 percent, leverage increased by 1.7 percent, capital expenditures increased by 19.1 percent, and capital expenditures per sales dollar increased by 3.6 percent during years 0 and +1 when compared to historical growth rates. Moreover, statistically significant increases in debt financing and capital expenditure growth were detected. However, the increased growth in leverage and capital expenditures per sales dollar were not statistically different from historical growth rates.

By contrast, the median *SE*-retaining firm (Panel B) experienced declining growth in total debt (−1.8 percent) and leverage (−5.8 percent), and increasing growth in capital expenditures (13.0 percent) and capital expenditures per sales dollar (1.8 percent). The between-sample test results summarized in Panel C indicate that the increased growth in debt financing (DEBT and LEVRG) of *FC* firms was statistically greater than contemporaneous growth rates for *SE* firms.

Significant between-sample differences in capital expenditure growth rates were not detected.

Collectively, the results in Table 4 indicate that firms changing from *SE* to *FC* accounting experienced abnormal adoption-period increases in total debt and capital expenditure growth (relative to the base period), and in total debt and leverage growth (relative to *SE* firms). These results, together with those in Table 3, are consistent with an increased demand for *FC* accounting. Firms that are highly levered (Table 3) and that issue additional debt or expand their exploration activities (Table 4), increase the likelihood of technical default and, therefore, have an increased demand for accounting procedures that reduce the probability of default. The *FC* method is one vehicle that oil and gas producing companies can utilize for this purpose.

Summary and Conclusions

This study examined the circumstances surrounding voluntary changes from "successful efforts" to "full cost" accounting by oil and gas producing companies during the period from 1970 through 1976. One explanation offered for the differential use of *SE* and *FC* methods is that highly levered oil and gas companies, or those with high drilling risk, select *FC* accounting in an attempt to reduce the probability of violating accounting-based debt covenant restrictions. Consistent with the results obtained in earlier studies of oil and gas accounting, firms that changed from *SE* to *FC* accounting were characterized by significantly higher *levels* of capital expenditures and debt financing in the year of *FC* adoption when compared to firms that retained *SE* accounting. However, systematic differences in static measures of debt covenant proximity and exploration intensity were found to exist at least two years before *FC* adoption. On the other hand, firms that changed to *FC* accounting exhibit significant *increases* in debt financing and capital expenditure growth around the time of *FC* adoption relative to historical growth rates and to contemporaneous growth rates for firms that retained *SE* accounting.

The general conclusion suggested by the data is that *FC* adoption is associated not only with high leverage and capital expenditure levels, but also with concurrent increases in debt financing and (to a lesser extent) exploration activities. This finding remains consistent with the debt covenant hypothesis in that highly levered firms that issue additional debt and/or expand their drilling activities face an increased likelihood of technical default and, therefore, have an increased demand for accounting methods that reduce default probability. Because *FC* accounting is one method that oil and gas producing companies can use for this purpose, we would expect *FC* adoption to occur concurrently with abnormal increases in debt financing and exploration activity.

Several important limitations to the empirical tests should be noted. First, lacking detailed information about the contractual provisions of firms' public and private debt agreements, and about firms' drilling activities, we can only speculate about the appropriateness of the debt covenant proximity and exploration intensity variables used here. The degree of measurement error present in these proxy variables may have been sufficient to obscure subtle (but economically important) differences in firms' demand for *FC* accounting. Absent precise measures of technical default probability, our empirical procedures must be interpreted as providing an indirect test of the debt covenant explanation for *FC* adoption. A related limitation is the absence of a formal model linking changes in exploration activity and leverage to changes in default risk. While Sunder's [1976] model could be extended to address this question, the empirical implications that would result from that exercise are likely to prove untestable without more complete information about firms' debt agreements and drilling activities.[17] Finally, we provide no explanation why *FC* adopting firms are highly levered two years before the accounting method change, nor do we explain why these firms exhibit abnormal increases in debt financing and capital expenditures around the time of *FC* adoption. In this respect, our ability to explain the change from *SE* to *FC* accounting remains incomplete.

Major refinements in the variables used as proxies for accounting demand, and in the economic incentive arguments from which those variables are derived, are undoubtedly required if we are to fully understand the dynamic forces that cause firms to change accounting methods [Holthausen and Leftwich, 1983; Kelly, 1983]. Toward that end, our results suggest that future studies seeking to identify factors associated with endogenous accounting changes might be more appropriately directed toward documenting contemporaneous (rather than *ex post*) associations between incentive variables and accounting method choice.

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[17] Sunder's [1976] analysis provides a basis for constructing algorithms that can be utilized to recast the accounting numbers produced under one method (e.g., *SE*) to those that would have been produced under the alternative (e.g., *FC*) method. The required parameters include: the probablity of a successful drilling, net operating cash flows per successful well per period, exploration cost per well, the life of a successful well, and the number of exploratory wells drilled each period. We were unable to pursue this avenue because information crucial to parameter estimates (i.e., drilling activity and success rates) was not available.

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Participative Budgeting: Effects of a Truth-Inducing Pay Scheme and Information Asymmetry on Slack and Performance

Chee W. Chow, Jean C. Cooper, and William S. Waller

ABSTRACT: This paper provides empirical evidence on a truth-inducing pay scheme widely discussed and analyzed in the incentive contracting literature. An experiment was conducted in which subjects acted as subordinates who performed a production task. Budgets were participatively set under either a truth-inducing or slack-inducing pay scheme and either the presence or absence of a superior-subordinate information asymmetry about subordinate performance capability. Slack was defined as expected performance minus the participatively set budget. The results showed that, when the information asymmetry was absent, slack did not differ significantly between the pay schemes. However, when the information asymmetry was present, slack was significantly lower under the truth-inducing scheme. Similarly, the pay scheme and information asymmetry variables interacted to affect performance.

Two purposes of budgets are to motivate subordinate performance and facilitate planning. In many cases, the same budget level is used to achieve both purposes. Unfortunately, setting an appropriate budget can be a major problem when a subordinate has better information than a superior about factors that influence performance and the former's pay depends on performance *vis-a-vis* the budget. For motivational purposes, the optimal budget may depend on many factors (e.g., the subordinate's tastes, beliefs, and opportunities) and need not equal expected or reasonably attainable performance [Demski and Feltham, 1978]. For planning purposes, however, the budget should be equal to expected performance. Given that the subordinate has better information, there may be planning benefits from participative budgeting. But, this creates a new incentive problem. When a subordinate's pay increases as budget difficulty decreases,

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Chee W. Chow is Vern Odmark Professor of Accountancy, San Diego State University, Jean C. Cooper is Assistant Professor of Accounting, University of Colorado-Denver, and William S. Waller is Associate Professor of Accounting, University of Arizona.

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ceteris paribus, he or she may bias the communication of private information such that a relatively easy budget is set, thereby creating "slack," i.e., understatement of expected performance [Schiff and Lewin, 1970]. Without proper incentives for truthful communication, as well as for performance, some benefits of participative budgeting to an organization may be lost.

Analytical research in accounting and economics has examined truth-inducing, budget-based pay schemes that alleviate simultaneously incentive problems regarding subordinate motivation and communication of private information [Ijiri, Kinard, and Putney, 1968; Weitzman, 1976; Loeb and Magat, 1978; for a review see Jennergren, 1980]. Under certain assumptions, such schemes induce a subordinate to prefer a budget equal to his or her expected performance, and participative budgeting is a means by which this preference can be expressed. In addition, such schemes provide incentives to maximize performance *regardless* of the budget. Despite their apparent value, the reported use of such schemes by organizations in free market economies has been rare [Gonik, 1978].[1] Further, there is little empirical evidence on their effectiveness [Young, 1985; Waller, 1987].

This paper provides evidence on the effects of a truth-inducing pay scheme and information asymmetry on slack and performance. An experiment was conducted in which subjects acted as subordinates who performed a production task. Budgets were participatively set under a truth-inducing or slack-inducing pay scheme, and a superior-subordinate information asymmetry about subordinate performance capability was present or absent. The results show that, when the information asymmetry was absent, slack did not differ significantly between the pay schemes. However, when the information asymmetry was present, slack was significantly lower under the truth-inducing scheme. Also, the pay scheme and information asymmetry variables interacted to affect performance.

The remainder of the paper is organized as follows. The second section provides a background and develops the hypotheses tested in the experiment. The third and fourth sections present the method and results of the experiment, respectively. The last section contains a discussion and some concluding remarks.

BACKGROUND AND HYPOTHESES

Prior research in organizational behavior (see Locke, Shaw, Saari, and Latham [1981]) and agency theory (see Baiman [1982] and Namazi [1985]) suggests that subordinates trade off job effort and leisure based on the perceived marginal rate of transformation between effort and performance and between performance and the marginal value of rewards. While a superior often has limited control over (and perhaps limited knowledge about) a subordinate's perceptions and preferences, he or she still may influence the latter's effort by using performance-based incentives in the employment contract.

The organizational behavior and agency literatures further support the notion that using budgets in employment contracts can affect subordinates' effort, though the literatures offer different explanations for these effects. Organizational behavior research emphasizes the presence/absence of goals, goal difficulty, and whether goals are assigned or participatively set. It has produced substantial evidence that specific, difficult goals lead to better performance than do easy or medium goals, "do your best" goals, or no goals at all, and that the link between participation and performance is generally weak [Mitchell, 1979 and 1982]. Unfortunately, a major limitation of this research is that it rarely considers the effects of pecuniary rewards/penalties for performance *vis-a-vis* the budget (for an exception see Brownell [1982]). Agency research, on the other hand, recognizes the interaction of budgets and compensation functions. Emphasis is placed on how the budget level, in conjunction with budget-based rewards/penalties, can be used to cope with information asymmetries regarding factors such as the subordinate's ability or effort [Demski and Feltham, 1978]. However, the agency literature is limited by the lack of extensive empirical testing [Berg, Daley, Dickhaut, and O'Brien, 1987] and its failure to recognize noneconomic factors [Arrow, 1985; Perrow, 1986].

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[1] Truth-inducing pay schemes are widely used in centrally-planned economies [Berliner, 1975].

Combining the behavioral and agency perspectives, a reasonable conclusion is that both budgets *and* budget-based pay can play important roles in employment contracting. In the following sections, we discuss more specifically how budget-based contracts may affect slack and performance in participative budgeting contexts.

Budgetary Slack

In many organizational settings, a subordinate has more accurate information than his or her superior about factors influencing performance. For example, a subordinate may be more knowledgeable about his or her own performance capability (i.e., ability and/or degree of effort aversion) and expected effort [Waller and Chow, 1985]. Such an information asymmetry produces a potential gain from participative budgeting. Analytical research has demonstrated that resource allocations can be improved by the communication of the subordinate's private information [Magee, 1980; Christensen, 1982; Baiman and Evans, 1983]. A key assumption in these studies is that a truth-inducing incentive scheme is used. Under such a scheme, the subordinate's expected utility is maximized by truthfully revealing private information, e.g., proposing a budget equal to expected performance in participative budgeting.

The following scheme has been shown analytically to have this truth-inducing feature, as well as incentives to maximize performance [Weitzman, 1976]:

$$\begin{aligned} B &= B' + b(y''-y') + a(y-y''), \\ &\quad \text{if } y > y'' \\ &= B' + b(y''-y') + c(y-y''), \\ &\quad \text{if } y < y'', \end{aligned} \tag{1}$$

where B is the subordinate's bonus, y is performance, B' and y' are the initial bonus and budget, respectively, proposed by the superior, y'' is the budget as revised by the subordinate via participation, and a, b, and c are reward/penalty coefficients specified by the superior prior to participation such that $0 < a < b < c$. Because $a < b$, the bonus would not be increased by biasing y'' downward and then performing above the budget. Because $b < c$, the bonus would not be increased by biasing y'' upward and then performing below the budget. Finally, because $a > 0$, there is an incentive for higher performance even when an unbiased budget has been reached.

Table 1 presents an example showing B as a function of y and y'', assuming that $B' = \$10$, $y' = 5$ units, $a = \$1$, $b = \$2$, and $c = \$3$. If a subordinate's expected performance is six units, he or she would maximize the expected bonus ($12) by setting $y'' = 6$. Further, if his or her performance reaches six units, he or she

TABLE 1

EXAMPLE OF BONUS PAY AS A FUNCTION OF BUDGET AND PERFORMANCE LEVELS
(a=\$1, b=\$2, c=\$3)

	Budget (y″)				
Performance (y)	*3*	*4*	*5*	*6*	*7*
3	\$ 6*	\$ 5	\$ 4	\$ 3	\$ 2
4	7	8*	7	6	5
5	8	9	10*	9	8
6	9	10	11	12*	11
7	10	11	12	13	14*

* Maximum bonus given performance.

would still have an incentive to do better (i.e., to produce seven units and earn \$13).

Weitzman's [1976] analytical results depend on a number of assumptions. First, the subordinate is a bonus- or an expected bonus-maximizer. Thus, when there is state uncertainty, the subordinate must be risk-neutral. Also, there must not be other factors such as utility for lying or telling the truth that affect the subordinate's behavior. Second, when effort affects performance, the marginal utility of pay must exceed the marginal disutility of effort. Numerous analytical studies have shown that effort aversion *per se* does not necessarily upset the truth-inducing feature [Weitzman, 1976; Snowberger, 1977; Miller and Thornton, 1978; and Bonin and Marcus, 1979]. Third, there is a single production period, so that there is no incentive for the subordinate to understate current expected performance in order to avoid adverse revisions by the superior in subsequent periods' bonus parameter values (see Weitzman [1980]). Fourth, there is no pre-production allocation of resources to the subordinate based on the participatively set budget. When a superior relies on the budget for such resource allocation, the truth-inducing feature may be impaired [Loeb and Magat, 1978; Conn, 1979]. In resource allocation contexts, other incentive schemes may have to be considered [Groves and Loeb, 1979; Harris, Kriebel, and Raviv, 1982; and Antle and Eppen, 1985].

Whether truth-inducing schemes are effective in practice where one or more of the above assumptions is relaxed is an empirical question. To date, two experimental studies have reported empirical evidence on truth-inducing incentive schemes [Young, 1985; Waller, 1987].[2] In Young [1985], subjects participatively set budgets and performed a production task under state uncertainty and either the presence or absence of a superior-subordinate information asymmetry about subordinate performance capability. The following variation of Equation 1 was used:[3]

$$B=by''-b\,|\,y-y''\,|. \qquad (2)$$

The general form of the pay scheme was

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[2] The present study's experiment was conceived and executed contemporaneously with, and independently of, that in Young [1985].

[3] Although this scheme has a truth-inducing feature similar to that in Equation 1, it provides a disincentive for performance in excess of the participatively set budget. As a result, its applicability is limited to situations where budget variances in either direction would impose a net cost on an organization.

held constant. The results were that subjects created slack, even though they were paid according to a truth-inducing scheme. Further, risk-averse subjects created more slack than non-risk-averse subjects did, where risk preferences were measured in a conventional manner (see Hershey, Kunreuther, and Schoemaker [1982]). In addition, when there was no information asymmetry, subjects felt more social pressure not to misrepresent their expected performance, and this social pressure was inversely correlated with slack. Thus, when a superior lacks information on a subordinate's performance capability, a pay scheme's incentives for truthful communication are relevant in participative budgeting. But, as the superior's knowledge about subordinate performance capability increases, the importance of the truth-inducing feature may decrease for two reasons: (1) there is less need for the superior to rely on information supplied by the subordinate, and (2) there is greater social pressure for the subordinate to avoid self-misrepresentation.

Waller [1987] examined the joint effect of a truth-inducing incentive scheme (Equation 1) and risk preferences on slack. Similar to Young [1985], subjects participatively set budgets and performed a production task under state uncertainty and the presence of a superior-subordinate information asymmetry about subordinate performance capability. However, the pay scheme was varied such that there was an incentive either to maximize or minimize slack. Further, risk preferences (i.e., risk neutrality versus risk aversion) were induced, not measured, using the technique discussed by Berg, Daley, Dickhaut, and O'Brien [1986]. The results were that, under the slack-maximizing scheme, slack created by risk-neutral subjects was about the same as that created by risk-averse subjects. However, when the truth-inducing scheme was introduced, slack created by risk-neutral subjects decreased significantly, while that created by risk-averse subjects did not change. In other words, the truth-inducing scheme was more effective under the condition of risk neutrality. Consistent with Young [1985], the results suggested that risk preferences are an important variable in explaining slack.

The present study's experiment provides additional evidence by manipulating the truth-inducing feature of the incentive scheme and information asymmetry about subordinate performance capability in a setting without state uncertainty. Incentives for truthful communication were manipulated by paying some subjects according to Equation 1 and other subjects according to a similar scheme in which $b<a=c$. Because $b<a$, the latter scheme provides an incentive to set $y''=0$, and accordingly is designated "slack-inducing." The presence/absence of a superior-subordinate information asymmetry about subordinate performance capability also was manipulated. The above discussion indicates the following hypotheses:

H1: Slack is lower under the truth-inducing pay scheme than under the slack-inducing pay scheme.

H2: The difference in slack under the truth-inducing and slack-inducing pay schemes is greater when there is a superior-subordinate information asymmetry about subordinate performance capability.

Performance

Aside from affecting budgetary slack, pay schemes also are expected to produce differences in performance. Under the slack-inducing scheme, the marginal pay for performance above the budget exceeded that under the truth-inducing scheme. By lowering the budget, a subordinate under the slack-inducing scheme could increase the range of performance paid at this higher rate. Further, given that the pay scheme and information asymmetry interact to affect slack through the participatively set budget, they will also interact to affect performance. This suggests the following hypotheses:

H3: Performance is lower under the truth-inducing pay scheme than under the slack-inducing pay scheme.

H4: The difference in performance under the truth-inducing and slack-inducing pay schemes is greater when there is a superior-subordinate information asymmetry about subordinate performance capability.

METHOD

Subjects, Task, and Design

A laboratory experiment with a generic task and setting was used to keep the hypotheses tests as clear as possible (see Swieringa and Weick [1982]). Subjects were 40 college students. The production task was adapted from Chow [1983] and involved decoding randomly sequenced letters (alphabetic characters) that had been punched on computer cards with the printing suppressed. Ten subjects were randomly assigned to each of four treatments, derived from crossing two independent variables: truth-inducing versus slack-inducing pay scheme and presence versus absence of a superior-subordinate information asymmetry regarding subordinate performance capability.

Procedure

The procedure may be described in terms of the following six basic steps:

1. The experimenter assumed the role of the "manager." Each subject came to the manager's office and was asked to assume the role of a worker in the manager's department. Together, the manager and subject read through a description of the remaining steps in the experiment. The decoding task was explained and demonstrated, and the subject was issued a file folder. The subject was instructed to place all experimental materials in this folder and keep it with him or her at all times.
2. The manager led the subject to the "workshop" and left him or her with the "accountant" (the experimenter's assistant). The accountant gave the subject a computer card deck for a five-minute practice session. Each subject in the information asymmetry group measured his or her own performance (i.e., number of letters correctly decoded) and placed all completed decoding sheets in a special envelope to which only he or she had access until the end of the experiment. Each subject in the information symmetry group had his or her performance measured by the accountant, who provided him or her with performance feedback. Then, the subject received a fresh computer card deck for a 30-minute "training session" at his or her normal speed. As with the practice session, performance was measured by either the subject (information asymmetry group) or the accountant (information symmetry group). In the latter case, the accountant prepared a performance

report, which the subject submitted to the manager at a subsequent meeting (See Step 4 below).

3. The accountant gave the subject a written description of the pay scheme. This description also explained the procedure for setting the budget and provided illustrations of how pay would vary with different combinations of budgets and performance. The subject was informed that his or her performance in the upcoming 30-minute "work session" would be paid for in cash according to the pay scheme and budget.

   The pay schemes were operationalized as follows. Performance was defined as the number of letters correctly decoded. For the truth-inducing scheme, a=\$0.01, b=\$0.02, and c=\$0.03. These values conform to Weitzman's [1976] suggestion that $a(c)$ should be at least 30 percent less (greater) than b. For the slack-inducing scheme, a=c=\$0.03 and b=\$0.02. The subject was told that, at the budget-setting meeting, the manager would propose a budget for the 30-minute work session. However, he or she would not be bound by this proposal. If the subject chose to set an alternative budget, this would automatically be accepted as his or her budget. The subject was instructed to return to the manager's office for setting the budget when he or she was ready.

4. At the budget-setting meeting, the manager told the subject that, based on his experience, an average worker could decode 226 letters in the training session. Also, typically, a 16 percent improvement would occur in the subsequent work session due to learning.[4] Then, the manager proposed a budget of 262 letters for the work session. The subject was told to take all the time he or she needed to evaluate this proposal and tell the manager the budget upon which he or she had decided.

5. The budget decided upon by the subject was entered into his or her contract form. The subject then completed a brief questionnaire requiring a performance estimate for the work session, placed the questionnaire in his or her folder, and returned to the workshop.

6. The subject completed the 30-minute work session with a fresh computer card deck and filled out an exit questionnaire. The exit questionnaire contained manipulation check questions. The information asymmetry question was: "Think back to the point in time immediately before you began to perform the decoding task for the work session. At that time, to what extent did the manager in the other room know about your level of skill in performing the decoding task?" The endpoints were: "Manager knew nothing about my level of skill" (1), and "Manager knew my level of skill exactly" (10). The pay scheme question was: "To what extent did the compensation contract induce you to set your performance standard equal to your expected performance?" The endpoints were: "To a very low degree" (1), and "To a very high degree" (10). Finally, the subject returned all experimental materials to the manager and was paid based on his or her performance, pay scheme, and budget.

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[4] The learning effect was estimated using a pre-test with 12 subjects. These subjects did not participate in the experiment.

TABLE 2

MEANS (STANDARD DEVIATIONS) OF MEASURED VARIABLES*

	Information Asymmetry				*Information Symmetry*					
	Truth-Inducing Pay Scheme		*Slack-Inducing Pay Scheme*		*Truth-Inducing Pay Scheme*		*Slack-Inducing Pay Scheme*		*Overall*	
Performance Capability	281.1	(92.6)	263.0	(84.5)	209.6	(79.5)	250.0	(76.8)	250.9	(84.6)
Budget Level	285.9	(83.0)	182.0	(104.5)	248.6	(24.4)	225.5	(62.7)	235.5	(81.3)
Expected Performance	285.2	(90.5)	273.8	(100.5)	277.3	(83.7)	263.5	(54.4)	274.7	(80.9)
Slack	8.1	(11.6)	91.8	(169.6)	28.7	(74.0)	38.0	(48.3)	42.5	(98.3)
Performance	365.8	(102.8)	370.0	(152.8)	341.7	(83.2)	338.6	(94.4)	354.0	(108.1)
Total Pay	$6.51	($1.78)	$9.28	($4.95)	$5.90	($.94)	$7.90	($2.74)	$7.40	($3.17)

* $n=40$ except for expected performance where $n=39$.

Measures

Performance capability was measured by the subject's performance in the 30-minute training session. The budget was that chosen by the subject. Expected performance was measured by the subject's performance estimate for the work session. Performance was the number of letters correctly decoded during the work session. Pay was the actual cash paid to the subject. Slack was measured by the difference between the subject's expected performance and budget. Manipulation check data were the responses to the exit questionnaire items.

RESULTS

Preliminary Analyses

Means and standard deviations of the measured variables for each treatment group and overall are presented in Table 2. A correlation matrix of these variables is presented in Table 3. One subject failed to provide an estimate of performance for the work session and was omitted from all analyses involving expected performance.

The manipulation for the presence/absence of an information asymmetry was quite successful, while that for the pay schemes' truth-inducing feature was moderately so. For the information asymmetry question, subjects in the information asymmetry group had a mean of 2.9 and standard deviation of 2.8, while subjects in the information symmetry group had a mean of 6.1 and standard deviation of 2.8 ($t=5.4$, $p<0.01$). For the pay scheme question, subjects with the truth-inducing scheme had a mean of 6.9 and standard deviation of 3.3, while subjects with the slack-inducing scheme had a mean of 3.3 and standard deviation of 3.3 ($t=1.8$, $p<0.08$).

Hypotheses Tests

H1 and H2 were tested with an analysis of covariance using slack as the dependent variable, pay scheme and information asymmetry as factors, and performance capability as a covariate (Panel A of Table 4). The covariate was included because performance capability may affect the amount of slack. For example, under the slack-inducing scheme, expected pay is maximized by setting the budget equal to zero. At the same time, expected performance is expected to increase with performance capability.

Although mean slack was lower under the truth-inducing scheme, the difference was not significant. These results

TABLE 3
PRODUCT MOMENT CORRELATION MATRIX*

	Expected Performance	*Budget Level*	*Slack*	*Performance*	*Total Pay*
Performance Capability	.85 (.001)	.32 (.023)	.48 (.001)	.81 (.001)	.68 (.001)
Expected Performance		.25 (.063)	.62 (.001)	.73 (.001)	.59 (.001)
Budget Level			−.60 (.001)	.14 (.200)	−.23 (.077)
Slack				.51 (.001)	.69 (.001)
Performance					.86 (.001)

* Parentheses indicate two-tailed probability.
$n=40$ for all except expected performance where $n=39$.

do not support H1. However, the interaction between pay scheme and information asymmetry was significant at $p=0.07$. When information asymmetry was absent, slack was about the same under the two schemes, but when the information asymmetry was present, slack was lower under the truth-inducing scheme (Table 2). These results provide some support for H2.

Table 5 reports results of additional analyses which compare performance capability, expected performance, and the budget level between and within pay scheme groups. Performance capability and expected performance did not differ significantly between pay schemes. However, the budget level under the slack-inducing scheme was significantly lower than that under the truth-inducing scheme. Within the truth-inducing scheme group, the budget level was not significantly different from expected performance, although both expected performance and budget levels were significantly higher than performance capability. These subjects apparently incorporated an expected learning effect into their performance estimates and, because they were affected by the truth-inducing feature of the pay scheme, also into their budgets. Within the slack-inducing scheme group, the budget level was significantly lower than performance capability and expected performance, while performance capability and expected performance did not differ. These subjects set their budgets below the performance level they had already attained and below the performance level they expected to attain in the future.

H3 and H4 were tested with an analysis of covariance using performance as the dependent variable, pay scheme and information asymmetry as factors, and performance capability as a covariate (Panel B of Table 4). Although mean performance was lower under the truth-inducing scheme, the difference was not significant. These results do not support H3. However, the interaction between pay scheme and information asymmetry was significant at $p=0.09$. When information asymmetry was present, performance was higher under the slack-inducing scheme, whereas when information asymmetry was absent, performance was slightly higher under the truth-inducing scheme. These results provide some support for H4.

DISCUSSION AND CONCLUDING REMARKS

This paper has provided empirical evidence on a truth-inducing pay scheme

TABLE 4

ANALYSES OF COVARIANCE FOR SLACK AND PERFORMANCE*

	Panel A—Slack		*Panel B—Performance*	
	F-*statistic*	*Probability*	F-*statistic*	*Probability*
Covariate:				
Performance Capability	11.52	0.002	73.13	0.001
Main Effects:				
Pay Scheme	1.81	0.190	0.66	0.422
Information Asymmetry	0.01	0.930	0.31	0.580
Interaction Effects:				
Pay Scheme by Information Asymmetry	3.55	0.070	3.07	0.089
Explained	4.22	0.010	19.29	0.001

* $n=40$

widely discussed and analyzed in the incentive contracting literature. A key result was that the truth-inducing scheme produced significantly less slack (i.e., expected performance minus the participatively set budget) when a superior-subordinate information asymmetry about subordinate performance capability was present. There was essentially no difference in slack between pay schemes when the information asymmetry was absent. This interaction effect may be explained by taking into account Young's [1985] conclusions. When information asymmetry was present, social pressure not to misrepresent may have been relatively high, such that economic incentives were less important, leading to no difference between pay schemes. On the other hand, when information asymmetry was absent, social pressure not to misrepresent was relatively low, and economic incentives may have been more important. But, this explanation is not complete. Even when there was an information asymmetry and slack-inducing pay scheme, slack was not maximal, i.e., budgets were set above zero. Waller [1987] reported a similar result. A complete explanation would require consideration of other factors beyond economic incentives and social pressure not to misrepresent (e.g., personal integrity and conscience). Slack was also affected by performance capability, apparently through the latter's effect on expected performance. Another result was that the pay scheme and information asymmetry variables interacted to affect performance. This result may be attributed in part to the lower budgets set by subjects in the information asymmetry/slack-inducing pay scheme group. The lower budgets, in conjunction with the higher bonus rate for performance above the budget, may have led to this group's higher performance.

This study has several limitations. First, several of the assumptions underlying Weitzman's [1976] model were maintained (e.g., single period, no resource allocation). Second, the effectiveness of the truth-inducing scheme was evaluated relative to a pay scheme with an incentive to maximize slack. A more realistic baseline would have constrained the budget to exceed zero. Third, the value of information to the superior was

Table 5

Comparisons of Performance Capability, Expected Performance, and Budget Level Between and Within Pay Scheme Groups*

	t-statistic	*Probability*
Between Pay Scheme Groups:		
Performance Capability	0.41	0.63
Expected Performance	0.47	0.64
Budget Level	2.65	0.01
Within Truth-Inducing Pay Scheme Group:		
Expected Performance vs. Budget Level	1.53	0.14
Performance Capability vs. Expected Performance	4.05	0.01
Performance Capability vs. Budget Level	1.84	0.08
Within Slack-Inducing Pay Scheme Group:		
Expected Performance vs. Budget Level	2.33	0.03
Performance Capability vs. Expected Performance	1.33	0.20
Performance Capability vs. Budget Level	2.03	0.06

* two-tailed

$n=40$ for all analyses except expected performance where $n=39$.

left unspecified. Why should the superior care about information asymmetry? While attempts to answer this question are important, such attempts would take us beyond the domain of Weitzman's [1976] model. Finally, there was no measure of social pressure not to misrepresent or other potentially relevant behavioral variables.

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EDUCATION RESEARCH

Frank H. Selto, Editor

The Comparative Performance of MBAs vs. Undergraduate Accounting Majors in Public Accounting

Arnold Wright

ABSTRACT: In response to the greater challenges and competitive pressures facing the public accounting profession in recent years, many CPA firms have hired significant numbers of MBAs. Yet there has been little empirical evidence of the comparative performance in public accounting of MBAs *vis-a-vis* undergraduates with an accounting major (BAs). This issue has important implications as to the appropriate educational training for those entering the profession and for CPA firm recruiting strategies. This study traced the performance of 54 MBA and 56 BA entry level accountants over a nine year horizon. Performance was measured by advancement, turnover, and salary increases. MBAs advanced more rapidly in the firm than BAs but did not demonstrate significant differences in turnover or salary increases. MBAs from top rated schools, however, reached the manager level faster and experienced lower turnover rates than other MBAs and BAs.

THE appropriate educational preparation for individuals entering public accounting has always been of great concern to both the profession and accounting educators. Over the decade 1973–1983 approximately 18 percent of the graduates hired each year into public accounting have held Master of Business Administration (MBA) degrees with a concentration in accounting, although this percentage has declined recently (1980–1982) to about 11 percent annually. The percentage of MBAs hired varies dramatically by firm size and exceeds 40 percent for some of the larger firms [McInnes and MacNeill, 1983]. Despite the significant numbers of MBAs employed, there is little empirical evidence regarding on-the-job performance of these individuals in public accounting as compared to undergradu-

Arnold Wright is the Harold A. Mock Professor at Northeastern University.

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ate accounting majors with a Bachelor's degree (referred to as BAs). The purpose of this study is to provide evidence on this issue, which has important implications for the education of entry level accountants and recruiting strategies of CPA firms.

There have been several dramatic changes over the past two decades in the environment and nature of public accounting practice. Included are: (1) increased competition within the profession for clients producing the need for greater audit efficiency and an expansion in the range of services offered; (2) mounting exposure to litigation and the accompanying risks of monetary damages and loss of professional reputation; (3) greater complexity in business practices; (4) rapid and widespread acceptance and use of computers changing the nature of EDP-based accounting systems and the auditing of such systems; and (5) the proliferation of pronouncements from rule-making bodies [AICPA, 1983; DeNardo and Thornton, 1982].

As a result of these changes, there is concern as to whether the profession is attracting the types of people who can effectively lead the firms and the profession itself in the challenging, dynamic times ahead. MBAs from top-rated schools appear to be promising candidates for these challenges, yet thus far, CPA firms have had great difficulty in hiring such individuals.

Finally, the growing use of computers in auditing practice has resulted in a rapidly increasing proportion of the routine procedures, once performed by less experienced staff, now being automated. This development has led to a shift in personnel needs to more middle level, experienced individuals. Staff are thus expected to reach levels of responsibility more quickly with correspondingly increasing needs for greater communication and analytical skills. Consequently, educational background, staff retention, and rapid training are of greater concern than in the past.

These changes have led to a reassessment of the educational needs of those entering the profession. For example, in 1978 the AICPA recommended that a five-year professional accounting program of 150 semester hours become the minimum educational requirement. More recently, the AICPA's Commission on Professional Accounting Education [1983] has recommended a postbaccalaureate degree be required for new CPAs. These recommendations have been the subject of considerable debate, and alternative approaches have been identified such as modifying the curriculum of current undergraduate accounting programs (e.g., placing greater emphasis on communication skills), establishing five-year professional schools of accounting, or relying on MBA graduates with an emphasis in accounting [Spiceland et al., 1980; Schiff, 1980; and Kelsey et al., 1983].

This paper provides empirical evidence on the comparative performance in public accounting of graduates of BA and MBA programs in order to begin to assess the relative merits of relying on alternative educational backgrounds in dealing with the challenges currently facing the profession. The next section examines the arguments advanced for hiring greater numbers of MBAs in public accounting. The method and results are then described, followed by a discussion of the conclusions.

CONSIDERATIONS IN HIRING MBAs

Several articles identify key attributes that CPA firms seek in recruiting entry level personnel [Seaton and White, 1973; Anderson et al., 1980]. For example, DeNardo and Thornton [1982] stress that graduates are needed who (1) can adapt to the technological changes occurring in information systems, and (2) possess a broad background, allowing the firm the opportunity to offer an expanding range of client services to offset the limited growth outlook for auditing. MBAs who supplement their studies with accounting electives are often perceived to possess a comparative advantage over BAs on several dimensions including maturity, increased ambition, broader business knowledge, problem-solving abilities, strong communication skills, and leadership capabilities [Kelsey et al., 1983].

MBAs have demonstrated substantially higher pass rates than BAs on the CPA examination [National Association of State Boards of Accountancy, 1982; Leathers et al., 1982]. Better performance on the CPA examination may suggest MBAs possess a higher level of technical proficiency than undergraduates. However, there are other factors which may contribute to success on the CPA examination, such as study abilities or greater motivation and commitment. Also, the relation between proficiency on the CPA examination and success in public accounting has not been established.

The AICPA Commission on Professional Accounting Education [1983] compiled limited interview data which suggested that staff members with post-baccalaureate degrees advance more rapidly and experience lower turnover rates than those with an undergraduate education solely. However, those results are based on only two firms. Conflicting evidence was obtained from two other firms regarding turnover.

McDonough [1973] argues that the public accounting profession should actively recruit MBAs, since MBAs are a major source of managerial talent for industry. The prestige and stature of the profession largely rests upon the image of accounting that these future high-level executives carry with them. Hiring MBAs will also raise the visibility of the profession wihin the graduate business school. Accounting electives may then be offered to a number of interested MBAs. Thus, the profession will gain capable entry level candidates while also raising its prestige and presence among future business leaders.

Despite the perceived advantages of hiring MBAs with an accounting concentration, McDonough [1973] asserts that MBAs typically have very limited knowledge of accounting and little appreciation of the need for and nature of the attest function. McDonough also identifies other widely perceived disadvantages of MBAs as compared to BAs: higher salaries; sometimes unrealistic expectations as to salary and promotion adjustments; continual demand for interesting and demanding assignments; and an aversion to routine, detail tasks.

METHOD

Subjects

This research traced the on-the-job performance of 110 entry level accountants hired in 1973. That year was selected as the earliest base year where significant numbers of MBAs were hired to provide the longest horizon available to examine performance differences between BAs and MBAs. Discussions with personnel administrators at the participating CPA firm's offices indicated few MBAs were employed prior to 1973. The performance of subjects *while in public accounting* was examined over a nine-year period (1973–1981). Due to the significant turnover rate present in CPA firms, relatively few subjects were employed for the entire test period and,

TABLE 1
GEOGRAPHIC DISPERSION OF GRADUATES AND UNIVERSITIES

	Number of Subjects		
	MBAs	*BAs*	*Total*
California Universities	35	35	70
Universities throughout United States	19	21	40
Total	54	56	110

	Number of Universities Represented
San Francisco area	9
California (outside of San Francisco)	12
Throughout the United States	25
Total	46

thus, performance data reflect those individuals remaining with the firm at various points in time over the nine-year horizon. Subjects were drawn from the San Francisco offices of five of the Big Eight firms.

The highest ranking personnel administrator at each firm identified all graduates hired during calendar 1973 along with the highest degree earned at that time.[1] A maximum of 15 MBAs per firm and an equal number of BAs were then selected randomly. The maximum sample size of 15 MBAs per firm was established because few firm offices hired more than 15 MBAs at this time. Also, limiting the number of subjects per office ensured the data accumulation tasks would not be perceived as onerous, thus, allowing a broad representation of firms. Three of the firms hired fewer than 15 MBAs during the base year (1973). In these cases, all MBAs hired were included in the study and an equal sample of undergraduates was randomly selected.

Approximately half of the subjects held MBA degrees ($n=54$) while the remaining subjects were undergraduate accounting majors ($n=56$). The objective of obtaining exactly equal sample sizes for each group was not achieved due to one selection error by a firm. This error was discovered after all data was gathered. Due to the significant cost of data accumulation and the fact the sample sizes are sufficiently large and essentially equal, it was decided to proceed the analysis with the sample as initially determined.

Subjects represented 46 U.S. universities, both public and private and of various sizes. Table 1 provides data on the geographic dispersion of subjects and universities sampled. As indicated, dispersion of subjects by degree status was about evenly divided. California universities provided 35 MBAs and 35 BAs, and other U.S. universities provided 19 MBAs and 21 BAs. Seven universities were represented by five or more subjects.[2] Discussions with personnel administrators indicate the sample appears representative of new staff. There were no graduates of five-year professional schools of accounting in the sample, since in the base year of the study very few of these programs existed in the U.S. or had operated long enough to have produced graduates. Three Master of Science (MS) graduates in accounting were selected in the sample. These three are included with the MBA group in analyzing and reporting the results. All statistical tests were conducted with and without these MS staff with no important differences.

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[1] Data was not compiled on how many BAs later earned graduate degrees. Such later degrees may potentially confound the results.

Data Gathering

Due to the exploratory nature of this study, a model and/or hypotheses as to expected performance differences between MBAs and BAs are not advanced. The focus instead is on gathering performance data and identifying differences present.

Personnel administrators were provided a standardized data gathering form to obtain demographic and performance data from personnel files on each subject over the nine-year-period.[3] Personnel administrators also indicated the area of specialization that the individual had when *last* affiliated with the firm, i.e., audit, tax, or advisory services. To preserve confidentiality and privacy, personnel administrators established identification numbers for subjects and only they knew the names of the individuals.

The university granting the person's degree was dichotomously classified as either among the top 50 rated business schools (12 universities represented) or among "other" business schools (34 universities). The 50 highest-ranking U.S. universities were obtained by the overall quality rating provided by *The Gourman Report: A Rating of American and International Universities* [1977, 1980]. For MBAs, rankings of the top MBA programs were consulted, while for undergraduates the ratings of business baccalaureate programs were used for coding purposes. *The Gourman Report* is a comprehensive, widely cited and recognized ranking service of universities along numerous factors such as overall quality ratings by discipline, library facilities, and faculty. This reference service is updated every two years with the latest undergraduate rankings in the fifth edition (1985) and the graduate rankings (1985) in the third edition.

Performance Measures

Three performance measures were used as dependent variables to compare MBAs and BAs while in public accounting; these measures are widely cited in the industrial psychology literature as performance indicators [Dunnette and Borman, 1979]. The first measure was *advancement to various staff levels* (semi-senior, senior, supervisor, and manager). Advancement was determined in three ways: (1) years to attain the level since joining the firm; (2) advancement as compared to the office "norm," expressed as a ratio:

$$\frac{\text{actual time to attain a staff level}}{\text{average time to attain a staff level}}$$

and (3) the percent of individuals achieving various staff levels.

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[2]

	Number of Subjects
University of California-Berkeley	10
University of California-Los Angeles	8
University of Southern California	8
Golden Gate College	7
Stanford University	5
Brigham Young University	5
University of San Francisco	5

[3] A copy of the instrument is available from the author upon request.

To establish the "average" time to attain the various staff levels, personnel administrators from each office provided estimates from past firm statistics of the normal or usual time to reach each level. Estimates are intended to reflect the mean time to attain levels within the San Francisco office of each firm, although these time periods were also considered by personnel administrators to be representative of each firm nationwide. Thus, a ratio of less than 1.0 would indicate advancement at a faster rate than average.

The second performance measure examined was *turnover* as reflected by: (1) time with the firm; and (2) percent of subjects still with the firm at the end of the nine-year test period. Finally, the third performance indicator was *annual salary increases* computed as follows:

$$\frac{\text{salary } (t+1) - \text{salary } (t)}{\text{salary } (t)}$$

where t = year of interest.

This measure implicitly assumes that salary adjustments are based on a review and evaluation of performance for the prior year. In addition to data collected on the three performance measures, demographic profiles of subjects and absolute salary data were also gathered.

RESULTS

Demographic Data

MBAs and BAs possessed similar demographic profiles except for significant differences ($p \leq .05$) on three variables: age, grade point average (GPA), and university ranking. As expected, MBAs tended to be older and have higher GPAs than BAs. The mean age of MBAs was 26.0 years with a GPA of 3.5 as compared to 24.4 years of age and a GPA of 3.3 for BAs. The proportion of MBAs hired from highly-rated schools (52 percent) was significantly greater ($\chi^2 = 15.94$, $p = .003$) than that of BAs (16 percent). Discussions with personnel administrators indicated that it is a common practice to conduct recruiting efforts at a broader range of schools at the undergraduate level. Other demographic data collected, for which there were no significant differences found, included sex, accounting and non-accounting work experience, military experience, marital status, and children.

Sixteen of the MBAs also had undergraduate accounting degrees. To determine whether these individuals may have confounded the results, all analyses were repeated excluding them. The findings were basically the same as with all subjects included.

Subjects in the sample were initially hired into the audit area. To increase sample size, all staff were included in the study regardless of later area of specialization. Of the 110 subjects, only 15 eventually concentrated outside of audit (about evenly split between MBAs and BAs): 13 in tax and two in advisory services. The data were analyzed with and without these individuals; the findings and conclusions did not change. Thus, the results reported include all subjects.

Performance Comparisons of MBAs and BAs

Results comparing MBA and BA performance are reported in Tables 2 through 4. MBAs and undergraduates were compared on each of the three performance indicators. The statistical tests used reflect the underlying measurement scale of each performance variable. Time to achieve staff levels, annual salary increases, and time with the firm are measured on ratio scales and, thus, parametric t-tests were used to compare MBAs and BAs. Percent still with the firm and percent reaching various staff

TABLE 2
ADVANCEMENT WITHIN THE FIRM

	BAs		*MBAs*		*Statistical Tests*	
	Mean	*Standard Deviation*	*Mean*	*Standard Deviation*		*Probability*
Years to achieve staff level						
	(n=51)		(n=45)			
Semi-senior	1.06	.28	.97	.27	$t=1.65$	.10
	(n=36)		(n=40)			
Senior	2.29	.58	2.17	.72	$t=.76$	NS
	(n=19)		(n=21)			
Supervisor	3.89	.70	3.48	.58	$t=2.05$	.05
	(n=12)		(n=14)			
Manager	5.67	.81	5.54	.72	$t=.43$	NS
*Advancement as compared to firm norm**						
To semi-senior	.93	.24	.90	.28	$t=.58$	NS
To senior	1.03	.35	.93	.32	$t=1.12$	NS
To supervisor	1.14	.29	.97	.20	$t=2.05$	.05
To manager	.96	.13	.96	.15	$t=.10$	NS
*Percent of hires achieving staff levels***						
Semi-senior	91%		83%		$\chi^2=.87$	NS
Senior	64%		56%		$\chi^2=.55$	NS
Supervisor	34%		39%		$\chi^2=.12$	NS
Manager	21%		26%		$\chi^2=.11$	NS

Note: Only probability levels of $p \leq .10$ are shown.

* Mean values represent a ratio of actual time/firm average time. Thus, values over 1.0 indicate greater time than the firm norm was necessary to reach a certain position.

** Percentages relate to the original number of individuals hired in each group.

levels reflect nominal scales and accordingly nonparametric chi-square tests were utilized.

As indicated in Table 2, MBAs generally advanced more rapidly within the firm with significant differences present in the time to reach semi-senior ($p=.10$) and supervisor ($p=.05$). Also, MBAs exceeded the firm norm in advancement to all levels and proceeded significantly more quickly than BAs in achieving supervisor ($p=.05$). Thus, MBAs reached higher levels of responsibility more rapidly than BAs. Finally, although differences were not statistically significant ($p>.10$), a lower percentage of MBAs reached the semi-senior and senior levels than BAs in the earlier career stages but then higher percentages of MBAs later achieved the key supervisor and manager levels; e.g., 26 percent of MBAs attained manager vs. 21 percent for BAs. These findings suggest that attrition may be greater for MBAs than BAs at the lower staff levels but after this initial period the pattern reverses at higher levels.

Table 3 indicates that turnover (as measured by time with the firm and percentage still with the firm at the end of

TABLE 3
STAFF TURNOVER

	BAs ($n=56$)		MBAs ($n=54$)		Statistical Tests	
	Mean	*Standard Deviation*	*Mean*	*Standard Deviation*		*Probability*
Years with the firm	3.56	2.29	3.76	2.54	$t=.66$	NS
Percent of hires still with the firm in 1981	13%		16%		$\chi^2=.19$	NS

Note: Only probability levels of $p \leq .10$ are shown.

TABLE 4
ANNUAL SALARY INCREASES (PERCENT)

	BAs			*MBAs*			*Statistical Tests*	
Year	n	*Mean*	*Standard Deviation*	n	*Mean*	*Standard Deviation*	t	*Probability*
1973	23	10.04%	5.45%	16	5.38%	3.56%	2.89	.007
1974	42	11.98%	5.32%	44	11.00%	5.26%	.76	NS
1975	40	10.18%	4.27%	38	9.56%	4.22%	.57	NS
1976	24	9.38%	4.98%	25	8.00%	2.56%	1.25	NS
1977	16	10.63%	4.72%	16	10.69%	3.96%	.04	NS
1978	15	10.33%	5.74%	13	10.31%	3.70%	.01	NS
1979	11	14.46%	3.21%	12	11.83%	2.89%	2.06	.05
1980	8	13.25%	5.99%	11	12.82%	5.55%	.16	NS

Note: Only probability levels of $p \leq .10$ are shown.

the test period) was not significantly different across groups.[4] However, MBAs on average stayed with the firm slightly longer than BAs (3.76 years vs. 3.56 years), and more MBAs were still with the firm at the end of the nine-year test period (16 percent compared to 13 percent).

As shown in Table 4, annual percentage salary increases varied little across groups. BAs generally had greater mean percentage salary increases over the study period, especially in the first year ($p=.007$).

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[4] Turnover experience may vary by firm. To test whether there is a significant confounding firm effect present, the following analyses were performed:

Dependent Variable	*Test*
years with firm	Two way ANOVA—firm (1-5) & degree (BA or MBA) One way ANOVA—firms
percent of hires still with firm in 1981	Chi-square—BA vs. MBA by firm Chi-square—firms

None of the tests showed any significant firm effects ($p \leq .10$), thus supporting the aggregate findings. Additionally, similar chi-square tests were also conducted for "percent of hires achieving staff levels" with no significant firm effects present.

TABLE 5
BASE PAY DATA

	BAs			MBAs			Statistical Tests	
Year	n	*Mean*	*Standard Deviation*	n	*Mean*	*Standard Deviation*	t-*Statistic*	*Probability*
1973	27	$11,100	$1,194	17	$12,753	$1,016	4.73	.0001
1974	46	11,886	1,096	51	13,367	1,259	6.15	.0001
1975	47	13,650	1,402	46	15,241	1,580	5.14	.0001
1976	40	15,608	1,725	39	17,174	1,892	3.85	.0001
1977	29	17,300	2,069	25	19,910	1,966	4.73	.0001
1978	18	20,283	2,082	17	22,839	2,354	3.41	.0002
1979	16	23,369	2,871	13	26,762	2,481	3.36	.0002
1980	11	29,141	2,866	13	31,354	3,098	1.80	.085
1981	9	33,556	2,465	12	36,183	2,690	2.29	.033

To evaluate the relative salary costs of BAs versus MBAs, Table 5 presents mean base pay data for the two groups. Base pay rather than total compensation is examined, since the latter includes overtime compensation, which can vary substantially across firms and is a confounding factor. As Table 5 illustrates, MBAs were paid significantly higher salaries than BAs (on average, about $2,200 or 12 percent more annually).[5]

MBAs From Top Rated Schools

As discussed earlier, the business school affiliation of each subject was categorized as either among the top 50 rated business programs or among other programs. An additional research question is whether MBAs graduating from highly rated business schools perform differently than other MBAs and undergraduates. Of the 54 MBAs included in the study, 28 were from the top rated schools (MBA-TR) and 26 were affiliated with other universities (MBA-O). One-way ANOVA or chi-square tests were performed to compare these three groups. Table 6 compares the two MBA groups and BAs on the three performance measures described earlier. For significant differences found in the ANOVA analyses ($p<.10$), Scheffe paired comparison tests were later conducted.

The results for MBAs from highly rated schools are similar to those already reported with a few very notable exceptions. MBAs from highly rated schools advanced more rapidly to manager

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[5] In addition to the three principal performance measures described, *subjective performance ratings* were prepared by personnel administrators, who were asked to examine prior completed evaluation forms, and semiannually assess the relative quintile ranking the staff member would receive when compared to other individuals with similar experience (top 20 percent of staff, second 20 percent, etc.).

Since these ratings represent perceptions data and are drawn from secondary sources (not actual raters on the job), ratings data were considered as indirect measures of performance.

Results on this performance measure revealed only one significant difference in ratings over the nine-year period; MBAs showed higher ratings in the first half of year three ($p \leq .05$; $\chi^2=6.77$). However, MBAs displayed a higher percentage of ratings in the top 20 percent category in 11 of the 17 periods tested. On average, about 50 percent (23 percent) of MBAs and 40 percent (29 percent) of BAs were in the top (lower three) quintile(s). The ratings reported very few subjects in the lower three quintile categories, suggestive of the normal leniency ("grade inglation") in ratings found prevalent in public accounting [Wright, 1986].

TABLE 6

MBA PERFORMANCE BY UNIVERSITY AFFILIATION

	MBA Top 50 Universities		MBA Other Universities		BAs		Statistical Tests	
Performance Variable	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation		Probability
(1) ADVANCEMENT								
a. Years to achieve staff level								
Semi-senior	$(n=24)$ .92	.24	$(n=21)$ 1.02	.29	$(n=51)$ 1.06	.28	$F=2.23$	NS
Senior	$(n=16)$ 2.15	.77	$(n=24)$ 2.18	.69	$(n=36)$ 2.29	.58	$F=.30$	NS
Supervisor	$(n=13)$ 3.50	.65	$(n=8)$ 3.44	.49	$(n=19)$ 3.89	.70	$F=2.11$	NS
Manager	$(n=11)$ 5.32	.60	$(n=3)$ 6.33	.58	$(n=12)$ 5.67	.81	$F=2.55$	.10
b. Comparison to norm								
Semi-senior	.89	.25	.92	.31	.93	.24	$F=.26$	NS
Senior	.86	.21	1.02	.39	1.03	.35	$F=1.67$	NS
Supervisor	.92	.15	1.06	.24	1.14	.29	$F=2.92$	.07
Manager	.99	.15	.84	.15	.96	.13	$F=1.30$	NS
*c. Percent achieving staff levels**								
Semi-senior	86%		81%		91%		$\chi^2=.92$	NS
Senior	57%		54%		64%		$\chi^2=.84$	NS
Supervisor	46%		31%		34%		$\chi^2=6.06$	.08
Manager	39%		12%		21%		$\chi^2=12.34$	.04
(2) TURNOVER								
a. Years with the firm	4.43	2.86	3.04	1.97	3.56	2.29	$F=2.41$	.09
*b. Percent still with the firm**	29%		8%		13%		$\chi^2=5.26$	.001

TABLE 6—*Continued*

Performance Variable	*MBA Top 50 Universities*		*MBA Other Universities*		*BAs*		*Statistical Tests*	
	Mean	*Standard Deviation*	*Mean*	*Standard Deviation*	*Mean*	*Standard Deviation*		*Probability*
(3) ANNUAL SALARY INCREASE								
1973	5.00%	3.46%	5.75%	3.85%	10.04%	5.45%	$F = 4.45$	.019
1974	9.26%	5.30%	12.90%	4.60%	11.98%	5.32%	$F = 3.13$	.049
1975	9.40%	4.74%	9.72%	3.69%	10.18%	4.27%	$F = .23$	NS
1976	7.27%	2.25%	9.10%	2.69%	9.38%	4.98%	$F = 1.41$	NS
1977	9.75%	3.79%	13.50%	3.42%	10.63%	4.72%	$F = 1.16$	NS
1978	10.80%	3.91%	8.67%	2.89%	10.33%	5.74%	$F = .21$	NS
1979	12.00%	3.12%	11.33%	2.52%	14.46%	3.21%	$F = 2.09$	NS
1980	11.22%	5.26%	17.00%	1.41%	13.25%	5.99%	$F = .99$	NS

Note: Only probability levels of $p \leq .10$ are shown.
* Percentages relate to the original number of individuals hired in each group.

($p=.10$), indicating movement to the functional management levels of the firm primarily responsible for engagement planning, oversight, and client relations. These subjects also advanced more rapidly to supervisor when compared to the firm average than others, which seems to account for the significant difference reported in Table 3 indicating MBAs overall reach supervisor earlier than BAs. The MBA-TR group also revealed significantly lower turnover rates than BAs or MBA-O staff. Over 29 percent of the MBA-TR employees were still with the firm at the end of the test period, compared to 13 percent of the BAs and only eight percent of MBA-O group. On average, MBAs from the top ranked schools stayed with the firm longer and a higher percentage reached the supervisor and manager levels. These results suggest a performance advantage for MBAs from highly rated schools. However, by further dividing the MBAs into two groups, the sample size for each group is rather small.

Discussion and Conclusions

Even though CPA firms have hired many MBAs in recent years, little is known about the relative performance of MBAs in public accounting as compared to undergraduate accounting majors. This study found no significant differences between MBAs and BAs in turnover and percentage salary increases. However, MBAs displayed more rapid advancement (especially to supervisor) than BAs, perhaps justifying the higher salary costs incurred.

A noteworthy finding was that MBAs graduating from highly rated schools advanced more rapidly and demonstrated significantly lower turnover rates than BAs or other MBAs. Study of BAs from top rated schools is needed to determine the effect of schools' ratings.

Some would argue that the comparative advantages of MBAs are their higher-level, long-range skills such as leadership and analytical capabilities, which are reflected at the manager and partner levels and not the technical skills required in the lower staff levels examined in this study. Thus, the somewhat comparable performance found here may be viewed positively, indicating that MBAs can effectively compete in the earlier career stages. MBAs are then poised to assume managerial positions.

Although it is not possible to discern reasons for the frequent lack of significant differences between MBAs and BAs in two of the three performance measures studied here, alternative explanations may be explored. One explanation may be that there are key success attributes in CPA firms that are not directly related to educational background, such as aggressiveness and leadership skills. These attributes are personality factors that may not be related to university training, but stem primarily from socio-economic variables. For example, the Graduate Management Admissions Council has sanctioned a series of research studies since the 1960's examining factors predicting success in the MBA Program and later business careers. As part of this continuing program, in a comprehensive study of career progress seven years after graduation, Crooks and Rock [1979] found that personality, leadership, and motivational attributes were more important in predicting performance than achievement and aptitude measures such as grades or scores on the ATGSB Test (Aptitude Test for Graduate Studies in Business). Little is known about the relation between success in public accounting and various personality factors and/or professional/organizational attitudes. To the extent that such factors may systematically vary between MBAs and BAs, this may explain the performance differences identified here.

There are a number of limitations in the scope of this study that should be recognized. These limitations affect the generalizability of the findings but also represent opportunities for future research. The performance of newly hired accountants was traced over a nine-year period (1973–81). As discussed, this period may be insufficient to identify vital differences in the performance of MBAs vs. BAs at the partner level.

The time period examined may also present potential problems. Changes in the accounting profession as well as MBA programs in recent years might affect the comparative performance of MBAs vs. BAs. Additionally, through greater experience with MBAs, CPA firms may be developing and training MBAs further than in the "early" years of initial hiring of MBAs.

The comparative performance of graduates of five-year accounting programs was not addressed in this study. Such programs were not examined because in the base year they were too new and few in number to provide reasonable numbers of graduates for analysis over a sufficient time period to assess performance patterns.

A final consideration is that during the test period graduates of five-year programs or MSs could have been hired and may have affected the performance (advancement, etc.) of the subjects studied here. Such individuals were not controlled for and may have confounded the results. However, discussions with personnel administrators suggest such graduates were few in number and, thus, do not appear to have had a significant confounding effect in this study. Also, staff hired at a later time would not likely be in direct competition with the subjects studied here, who were employed earlier.

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Some Determinants of Student Performance in the First College-Level Financial Accounting Course

Robert K. Eskew and Robert H. Faley

ABSTRACT: This study develops a model to explain student examination performance in the first college-level financial accounting course. A multiple regression analysis explains 54 percent of the variance in examination performance and indices of aptitude and effort account for the majority of the variance explained. However, high school and previous collegiate performance, as well as previous specific and related academic experience, each account for a significant portion of the variance in examination performance above that explained by aptitude and effort. Discrepancies between the results of the present study and other published findings are discussed.

During the last several years there has been a significant increase in business school enrollment. As enrollment has grown, so has the number of students taking introductory courses in accounting or declaring accounting as their major area of study. Perhaps causally, or as a result, courses in bookkeeping/accounting have increasingly become part of the college preparatory curriculum of many secondary schools. Thus, the number of high school students taking bookkeeping/accounting courses has also steadily risen. These changes in secondary and collegiate accounting course enrollment have renewed interest among accounting educators about the effect of high school exposure to bookkeeping/accounting on the performance of students in college-level accounting courses.

Before the effect, if any, of high school exposure to bookkeeping/accounting can be adequately addressed, however, it is necessary to isolate those factors that may be related to student academic performance overall. Moreover, it is necessary to isolate factors that may be uniquely related to performance in collegiate introductory accounting courses. Together, these factors should contribute to an improved understanding of why some students perform better

Robert K. Eskew is Professor at the Krannert Graduate School of Management, Purdue University, and Robert H. Faley is Associate Professor in the Department of Administrative Sciences, Kent State University.

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than others in the first college-level financial accounting course and whether pre-college study of bookkeeping/accounting affects performance in the first college-level financial accounting course.

This paper develops a general model based on previous research findings to help explain differences in the examination performance of students enrolled in college elementary accounting courses. As part of that model, we include an explanatory variable indicative of high school bookkeeping/accounting experience. Both our research approach (i.e., developing a general model) as well as the inclusion in the model of a measure of previous bookkeeping/accounting experience should help those interested in better understanding the major determinants of student performance in the first college-level financial accounting course.

Factors Affecting Student Examination Performance

Factors affecting the overall academic performance of students have received considerable attention in the education literature. For example, it is well known that past academic performance is significantly related to future performance—i.e., grades predict other grades [Astin, 1971; Lavin, 1965; and Odell, 1927] and that standardized measures of academic aptitude (e.g., SAT or ACT scores) explain large amounts of the variance in overall academic performance [e.g., Hunt, 1978 or College Entrance Examination Board, 1963]. Research has also shown that measures of effort/motivation can explain significant portions of the variance in overall academic performance above that explained by grades and aptitude test scores [Grabe, 1981; Urugolu and Walberg, 1979; and Wolfe, 1981]. Moreover, the results reported above obtain at the collegiate level despite socioeconomic differences among students [Kaplan, 1982].

Research findings are mixed, however, regarding the effects of experience (as distinct from previous performance) in a subject matter area on subsequent performance in that or another area. For example, Wiley [1976] found strong relations between quantity of schooling and student achievement, while Karweit [1976] found less significant relations to be the rule. More specifically, in one of the few studies examining the relation of academic experience on later performance in that same area, Welsh, Anderson, and Harris [1982] reported that the variance in students' mathematics achievements could substantially be explained by differences in their amounts of experience in mathematics. In terms of experience related to accounting performance, Smith [1968] found that high school exposure to bookkeeping positively influenced performance in college elementary accounting. Smith also reported that students who had high school bookkeeping experience could successfully complete elementary accounting in substantially less time than those who had no experience. Moreover, Schroeder [1986] reported that there was no difference in college-level performance of students without prior high school accounting coursework and those with one year. However, Schroeder found that students with more than one year of pre-college study of accounting outperform the other two groups. Jacoby [1975] and Baldwin and Howe [1982], however, found that high school bookkeeping experience facilitated student performance only in the early stages of a first college-level accounting course; the reverse was true in the later stages of the course. On the other hand, Bergin [1983] and Baldwin, Wasson, and Howe [1978] found that high school accounting experience had no significant differential effect on performance in a first college-level financial accounting course.

None of the studies mentioned above that examined the effects of bookkeeping/accounting experience on subsequent performance sought to develop a general model to determine those factors which seem to influence student performance in the first college-level financial accounting course. This may account for some of the variability in results across studies.[1]

METHOD

Model Specification

Based on the research findings reported above, performance in the first college-level financial accounting course is hypothesized to be a function of a student's: (1) academic aptitude, (2) past and present academic performance, (3) effort/motivation, (4) previous exposure to the same subject matter area, and (5) exposure to more generally related subject matter areas. Academic aptitude is measured using the well-documented measure, SAT score [College Entrance Examination Board, 1963]. Past and present academic performance is measured by high school mathematics and English grades and collegiate grade-point average, respectively. The two high school grade indexes have been shown to be significantly related to overall high school performance [Lavin, 1965], and collegiate grade-point average is a self-explanatory measure. Although the use of number of quizzes taken as a measure of motivation is novel to the present research setting, this measure has properties similar to indices of effort/motivation used in other research [Urugolu and Walberg, 1979]. Previous exposure to the same subject matter is measured using a dichotomous variable such as that used in Baldwin and Howe [1982]. Exposure to more generally related subject matter areas is measured by the number of semester hours of collegiate math and statistics courses. Since financial accounting courses rely on some level of quantitative skills and since the Welsh, Anderson, and Harris [1982] study indicated that the quantity of experience in mathematics explained a significant portion of the variance in mathematics achievements, it appears to be appropriate to include this variable in this study. Additionally, since the first financial accounting course is taken early in the college careers of most students, it was felt that students entering the course with more college experience might perform better than those with little or no previous college-level experience. Speculatively, a variable measuring the number of credit hours of previous college study was included in the model.

The model can be specified as:

$$\begin{aligned} SUM_i = B_0 + B_1 SAT_i + B_2 HSG_i \\ + B_3 CG_i + B_4 NQ_i \\ + B_5 PAE_i + B_6 PRE_i \\ + B_7 HRS_i + e_i \end{aligned}$$

where

SUM = a measure of performance in the course equal to the total number of points earned on the four course examinations;

SAT = a measure of academic aptitude equal to the sum of the math and verbal scores from the Scholastic Aptitude Test, divided by ten;[2]

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[1] See Boehm [1977] or Terpstra [1981] for information on the important link between methodological rigor and variance across study outcome.

[2] Dividing the SAT score by ten is a space-saving measure employed by the University. It in no way alters present results.

HSG = High school grades—a measure of pre-college academic performance equal to the sum of mean high school math and English grades on an A=9.0 to D=0 basis;
CG = College grades—a measure of collegiate academic performance equal to last cumulative grade-point index, A=6.0 to F=2.0;
NQ = Number of quizzes taken—a measure of course-related effort/motivation;
PAE = "Previous" accounting experience—a measure of specific, academic experience represented by a dummy variable equal to one if the student had high school bookkeeping/accounting and a zero if otherwise;
PRE = "Previous" related experience—a measure of generally related experience equal to the number of semester hours of completed college-level math and statistics courses;
HRS = Hours—a measure of the quantity of previous college-level study equal to the number of semester hours of completed college-level courses;
e_i = a random error term;
i = a subscript indicating data for the ith student.

Replicability of research results is, in part, affected by the reliability of the dependent variable. The Kuder-Richardson 20 reliability estimate (a measure of each test's internal consistency—see McNemar [1969]) for each of the four exams that make up the dependent variable (*SUM*) was substantial. The average coefficients across alternate forms of each exam were: .782 (Exam 1), .833 (Exam 2), .810 (Exam 3), and .831 (Exam 4). Thus, we conclude that the dependent variable in this study appears to be reliable. Note that quiz points have been excluded from the *SUM* variable to avoid artificially inflating the significance of the relationship between the *NQ* and *SUM* variables.

The Course

At Purdue University introductory accounting is taught in large lecture sections only.[3] Each section has 300–475 students and is instructed by a faculty member. Students from several different majors in four of the University's nine schools are required to take the course. It is elected by students from most of the other schools as well. Each section meets either three 50-minute or two 75-minute periods per week for 15 weeks. There are no class meetings other than the lecture, but an assistance laboratory is available to students on a drop-in basis 60 hours per week. In the assistance laboratory graduate and undergraduate instructors are available to answer conceptual questions and help with problem solutions.

Grading Criteria

Three midterm examinations and a required final examination are given each semester. All examination questions are five-response, multiple-choice questions. Each midterm is a 25-question, 75-minute, 100-point examination. The final examination is a 40-question, two-hour, 160-point exam. In addition, 23, unannounced, one-question, five-response, multiple-choice quizzes are given. Each quiz is worth two points.

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[3] Some argue that little learning takes place in large lecture classes and that studies of student performance in these courses only measure what students knew before they entered the class. While there is little research on the subject, at least two studies suggest that learning is not affected by class size [Thibodeaux and Zuzan, 1984 and Peterson and Lemon, 1978].

However, although a student can earn as many as 46 quiz points, only 20 of the 46 points are used in setting the course scale. Because total quiz points can at most account for only slightly more than four percent of the total points in the course scale (i.e., 20 of 480), participation in the quizzes can be considered to be essentially voluntary.

Subjects

For this study, data from 453 students enrolled in one section from the Fall 1983 semester were used. Since the University's computerized assignment algorithm is considered to result in essentially random assignment of students to sections, and because the single section used in the study was randomly chosen, biases in the dependent variable due to differential selection of subjects should not obtain. Moreover, using data from a single section should mitigate against confounding due to factors such as differences in instructors, instructional patterns, and time-of-day.

Of the 453 students, 380 completed all course requirements (i.e., 73 students dropped the course, a proportion consistent with historical data). Of those completing all requirements, data from 28 students were deleted from the analysis because of missing information on one or more of the independent variables. The final sample consisted of 352 students.[4]

RESULTS AND DISCUSSION

A Hotelling's T^2 test [Tatsuoka, 1971] was computed between the mean vectors across all applicable variables for those students who completed and those who dropped the course. There was a statistically significant difference between the two vectors ($F_{(6,418)}=4.021$, $p<.01$). Thus, students who completed and those who dropped the course appear to have been drawn from populations with different means for the variables included in the multivariate analysis.[5] Therefore, the results of this study are applicable only for students who completed the introductory accounting course, a significant majority of those who originally enrolled. The means and standard deviations for all variables for the 352 person sample and for the applicable variables for students who dropped are presented in Table 1.

Multiple regression results are presented in Table 2. Results indicate that the null hypothesis of no effects should be rejected in favor of an alternative: that the variables explain a significant amount of the variance in course performance ($R^2=.541$, $p<.001$).[6] An adjusted R^2 value was computed based on the statistical correction formula suggested by McNemar [1969]. The adjusted value is .531, which indicates there is little shrinkage in the predictive power of the model across samples. The standardized beta for ech variable appears in column 2 of Table 2. All betas are positive, a result consistent with expectations as all independent variables were thought

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[4] Student data for the independent variables were secured from an electronic data base maintained by the registrar. Data on the previous exposure to accounting courses variable (*PAE*) were secured from a self-report questionnaire administered to the students. Data on exams and quizzes were secured from an electronic data base developed from machine scored exams and quizzes.

[5] Individual *t*-tests on means indicated that means for the *SAT*, HSG, and *PAE* variables were significantly smaller for students who dropped. The means for the remaining variables (the *NQ* variable is not applicable for the students who drop) were not significantly different.

[6] A visual inspection of the residuals scatterplot (versus estimated *Y*-values) indicated no evidence of heteroscedasticity. We also calculated the statistic *h* (see Anscombe [1961]), which indicates whether a linear relation exists between residuals and estimated *Y*-values. The *h* statistic indicated no heteroscedasticity.

Table 1

Variable Means and Standard Deviations

	Students Completing Course (*N*=352)		*Students Dropping Course* (*N*=73)	
*Variable**	*Mean*	*Standard Deviation*	*Mean*	*Standard Deviation*
SUM	305.114	68.472	—	—
SAT	98.085	15.319	91.288	17.540
HSG	12.702	3.569	11.591	3.565
CG	4.464	.940	4.317	.797
NQ	19.261	4.394	—	—
PAE	.335	.473	.136	.346
PRE	12.645	7.091	11.652	6.960
HRS	45.406	25.080	47.015	17.540

* *SUM*=Total examination points
SAT=SAT score (verbal and mathematics)/10
HSG=High School Grades
CG=College Grades
NQ=Number of Quizzes taken
PAE="Previous" (high school) Accounting Experience
PRE="Previous" Related Experience
HRS=Previous semester hours earned

to positively influence examination performance.[7]

Six of the variables in the model (*SAT*, *NQ*, *HSG*, *PAE*, *CG*, *PRE*) contribute significantly to an explanation of the variance in student performance. The beta associated with *HRS* was not significant. The *HRS* variable was not hypothesized to be a "key" explanatory variable and its inclusion in the model was speculative.

Of the independent variables included in the full model, the coefficients of partial determination indicate that aptitude (*SAT*) and effort (*NQ*) have the largest marginal contributions. The maxim that ability plus effort leads to higher levels of performance apparently holds here. However, though aptitude and effort are considerably more explanatory than other variables in the model, the exposure to specific previous (*PAE*) and/or related present experiences (*PRE*) apparently does facilitate first-level college financial accounting course performance.[8] The *PAE* variable contributes

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[7] Since a number of students drop this course, the 352 person sample is likely to include a number of students who had previously enrolled in the course. If previous enrollment was a relevant explanatory variable, then coefficients for the other independent variables will be biased and inconsistent. To test for this potential bias, data were secured from the registrar identifying those students (45) who had previously enrolled in this course. A dummy variable (1 = previously enrolled, 0 = not) was employed. Correlations between the previous enrollment variable and the independent variables were negative (except for *HRS*, +.259) and small (absolute values less than .26). The correlation between the previous enrollment variable and *SUM* was −.241. A regression was estimated including the previous enrollment variable and the other seven independent variables. Regression coefficients of the remaining seven independent variables were essentially unchanged and R^2 increased from .5406 to .5417. Thus, we conclude that previous enrollment in this course was not a relevant explanatory variable.

[8] Both Bergin [1983] and Baldwin and Howe [1982] found that previous exposure to accounting facilitated student performance only in the first part of the introductory college course. The present study, however, found that pre-college exposure to accounting was helpful throughout. The coefficient for the *PAE* variable

TABLE 2
REGRESSION SUMMARY

*Variable**	*Standardized Beta*	F-*statistic*	*Probability*	*Coefficient of Partial Determination*	*Variance Inflation Factor*
SAT	.4207	87.810	<.001	.2034	1.5092
HSG	.2181	25.850	<.001	.0699	1.3781
CG	.1098	7.190	.008	.0205	1.2545
NQ	.2620	47.660	<.001	.1217	1.0786
PAE	.1473	15.255	<.001	.0425	1.0644
PRE	.1114	6.240	.013	.0178	1.4908
HRS	.0233	.294	.588	.0009	1.3831

* See key on Table 1

21.3 points (7.0 percent) to the total average number of examination points (305.1) earned.

The effects of collegiate grades (*CG*) and high school grades (*HSG*), as well as previous related experience (*PRE*) and previous accounting experience (*PAE*), are worth noting. Based on other research findings, it was expected that *CG* and *HSG* (recent and previous academic performance, respectively) would be moderately to highly intercorrelated and that only one or the other would contribute to the explanation of the variance in examination performance. In the case of specific (*PAE*) versus more general (*PRE*) previous experience, the contributions of each type of experience to overall performance was not clearly established in the literature. However, it was expected that *PAE* and *PRE*, like *CG* and *HSG*, would be moderately to highly intercorrelated, and that only one of the pair would significantly contribute to an explanation of the variance in examination performance.

Results here suggest something different. For example, in the case of *PAE* and *PRE*, the variance in overall examination performance explained by *PRE* includes significant variance not explained by *PAE*. This result may be related to the facilitating effect of a more general previous quantitative orientation (*PRE*) on performance in quantitatively oriented courses such as accounting. In the case of *CG* and *HSG*, once again, each variable is related to variance in course performance beyond that explained by the other. This finding may be related to differences in behaviors necessary for successful performance in high school and college. Or, in the case of both *PRE* and *CG*, the results may reflect the effects of "previous" and "recent" measures of experience and grades, respectively, on accounting course performance. Obviously, in the cases of previous performance and experience reported here, there are two "components" to each which help to explain present performance.

Multicollinearity

If, as is the case here, the magnitudes of some or all of the regression coefficients are important and there are intercorrelations among the independent

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was significant and positive in separate regressions for each examination ($p<.001$, $<.001$, .043, .005 respectively).

TABLE 3
CORRELATION MATRIX

*Variable**	HSG	CG	NQ	PAE	PRE	HRS	SUM
SAT	.453	.271	.015	−.128	.402	.059	.580
HSG		.322	.151	.012	.272	.053	.517
CG			.145	−.043	.150	.252	.348
NQ				.117	.016	−.114	.334
PAE					−.071	−.173	.110
PRE						.410	.360
HRS							.078

* See key on Table 1

variables, it is appropriate to attempt to evaluate the effects of the intercorrelations on the multiple regression results (i.e., assess multicollinearity). The correlation matrix is presented in Table 3. The correlations among the prospective independent variables are low ($<.4$) except for the *SAT/HSG*, *SAT/PRE*, and *PRE/HRS* variable pairs. The *PRE/HRS* coefficient is artificially high since *PRE* is included in *HRS*. Removing the credit hours of mathematics and statistics (*PRE*) from the total number of credit hours taken (*HRS*) does not affect the contribution of *HRS* to the explanation of overall performance in the course. However, the relative contribution of *PRE* is increased.

When multicollinearity is serious, the individual betas are often not significant when the overall regression model explains a significant part of the variance in the dependent variable. The results reported here indicate that the multiple regression betas are significant for six of the independent variables. Of the three potentially problematic intercorrelations involving four independent variables (*SAT/HSG*, *SAT/PRE*, and *PRE/HRS*) only the *HRS* variable does not have a significant beta coefficient. (It is also the case that the *HRS* variable has the lowest correlation with the dependent variable of the four.)

Another technique for evaluating the effect of multicollinearity among the independent variables is the variance inflation factor. Variance inflation factors are $1/(1-R^2)$ where the R^2 is from a regression for which one of the independent variables is the dependent variable and the remaining independent variables are the independent variables. The variance inflation factors are presented in Table 2. All are less than 2.0 and close to 1.0 except for the *PRE*, *HSG*, *HRS*, and *SAT* variables, the same independent variables noted as potentially problematic when the correlation matrix was evaluated. Neter, Wasserman, and Kutner [1985] suggest that a variance inflation factor greater than ten is often taken as a sign that multicollinearity may be a problem. Since the variance inflation factors in Table 2 are less than two, our evaluation is that multicollinearity is not a serious problem in this study.

SUMMARY AND CONCLUSIONS

Results presented here suggest that ability (*SAT*),[9] previous and more recent academic performance (*HSG* and *CG*), effort/motivation (*NQ*), related "previous" experience (*PRE*), and pre-college study of accounting/bookkeeping (*PAE*) are all significantly related to examination performance in this introductory accounting course. Certainly, these results may be specific to the students and the instructional setting.[10] However, the students are attending a large, public, state university. It is reasonable, therefore, to assume that they are representative of many students who enroll in introductory accounting courses in similar institutions.

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[9] In Baldwin and Howe [1982], the *SAT* score was disaggregated into its verbal and quantitative components. The regression used here was also computed with

Results for the pre-college exposure to accounting variable do conflict with other reported research. As noted, one possible explanation of the differences reported across studies is that the student populations in each study are different. More likely, however, the inability of the research designs in previous studies to control for the influence of many of the other factors shown here and in other studies to be related to overall academic performance produced specious results.

In addition to the research implications of the present study, there are various policy implications that may be derived from the results reported above —both for students and accounting educators. For example, the present findings should help high school vocational counselors better advise students wishing to pursue a collegiate accounting degree. Since introductory collegiate courses often "make-or-break" students, exposure (above a certain level) to high school accounting/bookkeeping courses may help mitigate the drop or failure rate among prospective accounting majors during one of the vulnerable stages of their collegiate careers. Unfortunately, the present research does not shed light on the amount of previous exposure associated with positive performance in the first college-level accounting course. Neither does it indicate whether this phenomenon generalizes to introductory managerial accounting courses.

On the other hand, knowledge of students' previous exposure to related high school courses may help accounting educators better structure their introductory courses. For example, it may be helpful to offer differently structured introductory accounting courses. Accounting departments could, as do some economics departments, offer a pre-introductory, survey-type course in the freshman year that examines some of the important concepts and procedures for students with inadequate or no prior preparation in accounting. Another possibility is to offer one introductory course for those with appropriate high school exposure and another course for those with inadequate or no previous exposure. The two courses could examine the introductory accounting material in different sequences or at different rates or use different books, or be taught by teachers better able to address the students' different proficiency levels. Offering the survey course or different introductory courses would be analogous to offering remedial or other types of instruction to

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SAT verbal and mathematics separated. Regression coefficients for both variables were significant ($p<.001$). The adjusted R^2 was larger (.5410) for the regression with *SAT* math and verbal separate. However, the correlation of *SAT* verbal with *SAT* mathematics is .5495. Therefore, we believe that it is appropriate to combine these two variables to remove one obvious source of multicollinearity.

[10] The drop rate for students in this sample (73/453 or 16.1 percent) is typical for this course but may not be typical for introductory accounting courses at other universities. The majority of students who enroll in this course are in their third or fourth semester. Typically half of the students are taking the course as an elective. Some students who elect the course are in their sixth, seventh, or eighth semester. Perhaps these more mature students are less inclined to drop as they have investigated the course and have determined that its content is relevant to their academic or professional interests.

students in order to mitigate their failure rates early in their collegiate careers. Thus, the development and use of alternative introductory courses could help reduce course failure rates as well as mitigate associated problems (such as students dropping accounting as a major) and, thus, better protect the accounting department's investment in its students.

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SMALL SAMPLE STUDIES

M. Edgar Barrett, Editor

Auditor's Use of Analytical Review in Audit Program Design

Stanley F. Biggs, Theodore J. Mock, and Paul R. Watkins

ABSTRACT: This research presents some descriptive evidence of how auditors perform analytical review in a complex and realistic task setting. Specifically, the research investigates how auditors who differ in terms of experience, design and conduct analytical review and revise audit programs in light of their analytical review judgments. To accomplish this purpose, a comprehensive case was administered to four auditors who performed the task while thinking aloud. The results show that both managers and seniors identified the crucial audit problems embedded in the case. However, there was little evidence that analytical review provided a basis for reducing the extent of planned substantive audit procedures even in audit areas where reduction seemed to be warranted. Also, several important behavioral differences were observed in the information acquisition and decision behavior of the managers and seniors. Some of these differences are consistent with differences found in studies of physics experts and novices can be attributed to constructs in human memory and reasoning research. Interestingly, the protocols produced almost no evidence of the use of probabilistic reasoning (e.g., Bayesian inference) by any of the auditors. However, there is evidence of their use of the kinds of reasoning processes being proposed and evaluated in artificial intelligence research.

ANALYTICAL review is a procedure that has the potential to increase the efficiency of audits since it is a relatively low cost procedure that seems to have considerable power for identifying errors and for guiding audits [Hylas and Ashton, 1982; Felix and Kinney, 1982]. Researchers have mainly focused on development of statistical and other formal models for use in the analytical review process in audits [e.g., Kinney, 1978; Stringer, 1975]. Research on the judgmental aspects of analytical review has involved relatively simple task settings [Kinney and Uecker, 1982; Blocher

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et al., 1983; Biggs and Wild, 1985; and Libby, 1985]. Research on the current practice of analytical review indicates that it is largely a judgmental process [Biggs and Wild, 1984; Tabor and Willis, 1985] that affects other audit procedures [Felix and Kinney, 1982]. However, no research has attempted to document judgments involved in linking analytical review to other parts of the audit.

The purpose of this research is to provide some initial descriptive evidence of how auditors perform judgmental analytical review in a complex and realistic task setting. Specifically, the research investigates how experienced (managers) and inexperienced (newly promoted seniors) auditors design and conduct analytical review and revise audit programs in light of their analytical review judgments. To accomplish this purpose, a comprehensive audit case was administered to four auditors who performed the task while thinking aloud.

RESEARCH DESIGN AND METHODS

The research was guided by some general theories of human decision-making. In particular, Newell and Simon [1972] provide evidence that decision-making can be described as information processing where decisions are composed of elementary information processes applied to information acquired from both memory and the external task environment. This theory provides the basis for assuming that information processing operations (called "operators") are the primary type of behavior to look for in the data.[1] Einhorn and Hogarth [1981] provide a framework that suggests several general categories of operations that compose decision-making processes. They view decision processes as composed of four interacting phases: (a) information acquisition, (b) information evaluation, (c) action/choice, and (d) feedback.[2] We examined auditors' decision behavior for operators that were consistent with Einhorn and Hogarth's components.

Task Design and Case Validation

Several important factors were considered in the task design. It was important to: (a) make the case as realistic as possible, (b) have the case contain some audit problems that could be detected through analytical review, and (c) have the case be comprehensive, in the sense of allowing observation of how auditors link analytical review judgments to audit program planning decisions. The resulting case study, Pacific Electronics (a large retailer of electrical appliances), was drawn from an actual audit client of a medium size audit firm. In particular, the auditor had made an adjustment to the valuation of the client's accounts receivable. The case materials included the pre-adjusted, or unaudited financial statements for the year in which the adjustment was made. In addition, a "standard" audit program from an international accounting firm was adapted for use as the basis for audit program planning decisions.

The case was validated by several experienced auditors from two interna-

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[1] While Newell and Simon's [1972] theory of human information processing is very basic, it is also general enough to apply to most decision situations. Note, it also suggests that the most significant factors to explain decision behavior are information processing factors (i.e., task environment, knowledge possessed by the subject, and the operations employed). Alternative theories might suggest factors such as personality or other individual differences as the first place to look to explain decision behavior.

[2] The "feedback" component was not specifically addressed since the research involved a single case.

tional accounting firms, who reviewed it for realism, completeness, and for any features that would represent a firm bias. The case's final form contained over 100 pages of material including: economic, industry, and company background; audit planning material; internal control evaluation information; five years of financial statements including footnotes; schedules containing analyses of sales, aging of accounts receivable and operating expenses, and quarterly financial statements; and standard audit programs for four major accounting cycles (Non-Trade Notes, Revenue, Inventory, and Accounts Payable).

Subjects

An important research design factor involved comparing decision behavior of auditors who differed in terms of experience. Two managers (designated M1 and M2), each with seven years audit experience, were supplied by international accounting firms in Los Angeles. Two senior auditors (designated S1 and S2), each with less than three years of audit experience, were obtained from the Milwaukee offices of the same firms who provided the managers. The four subjects were considered by their respective partners to be among the most competent in their offices at their level of experience.

Procedures

Subjects participated in two sessions. In the first session (Phase I), subjects reviewed the case and prepared a program of analytical review procedures, including a list of analytical review information (e.g., financial ratios), to be supplied by the researchers at a subsequent session. At the second session (Phase II), subjects received the requested information and reviewed a planned audit program for Pacific Electronics. On the basis of the subjects' analytical review, each step of the planned substantive audit program was evaluated with respect to nature, timing, and extent. Any adjustments to the program were to be noted on the audit program.

To trace their decision processes, verbal protocols were obtained from auditors. Verbal protocol analysis requires subjects to verbalize their thoughts into a tape recorder as they perform a task.[3]

The audio tapes were transcribed by breaking the verbalizations into short phrases [Newell and Simon, 1972; Payne et al., 1978]. This resulted in over 600 pages of transcripts and over 8,000 lines of verbal protocol phrases (see Table 1). The transcripts were then analyzed and coded using the operators in Appendix A.[4]

RESULTS

Results are presented in sections based on the categories of Einhorn and Hogarth's [1981] model (i.e., information acquisition, evaluation, and decisions).[5]

Auditors' Information Acquisition Behavior

To measure information acquisition behavior, the case information was partitioned according to traditional auditing categories. The primary categories used

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[3] The instructions to verbalize simply asked the subjects to verbalize all thoughts as they performed the task. Thus, the procedures were consistent with verbalization instructions recommended by Ericsson and Simon [1984, 1980]. These instructions have been shown to avoid significant interference with subjects' task related cognitive processes. A short practice session was conducted where the subjects analyzed a simple problem from an intermediate accounting textbook.

[4] A detailed discussion of protocol methods can be found in Biggs et al. [1988].

[5] Biggs et al. [1988] elaborates with detailed results, including tables, flowcharts, episode abstracts, and details on the audit program that was evaluated.

TABLE 1
TABULATION OF SUBJECTS' PERFORMANCE OF TASK

	Managers		*Seniors*	
Data Collected	*M1*	*M2*	*S1*	*S2*
Audit Experience	7 Yrs.	7 Yrs.	2.5 Yrs.	3 Yrs.
Approximate Time	4.75	5	4	4.5
Words in Protocol (estimated)	17,900	24,544	15,838	18,902
Operators Generated Phase I	510	1,439	236	587
Operators Generated Phase II	329	689	495	607

Percentage of Operator Use for Each Phase

	M1		*M2*		*S1*		*S2*	
Operator Type	*Phase I*	*Phase II*	*Phase I*	*Phase II*	*Phase I*	*Phase II*	*Phase I*	*Phase II*
TASK STRUCTURING:								
Set Goal	2%	1%	0%	0%	2%	1%	1%	1%
INFORMATION ACQUISITION:								
Information Search	9	12	22	6	11	5	12	3
Direct Reading	8	19	11	24	0	12	9	16
Algebraic Calculation	1	0	9	0	0	0	2	0
Information Retrieval	2	3	7	6	0	3	4	3
Subtotal:*	21%	33%	49%	36%	11%	19%	26%	23%
INFORMATION EVALUATION:								
Assumption	3	3	1	0	1	0	4	4
Conditional Judgment	13	5	5	4	4	7	17	14
Comparison	5	4	10	5	8	1	4	1
Evaluation	36	29	24	21	40	35	28	33
Decision Support	1	0	1	5	0	0	0	0
Generate Query	6	4	4	1	7	1	12	2
Subtotal:*	64%	46%	44%	36%	60%	45%	65%	53%

TABLE 1—*Continued*

Operator Type	*M1*		*M2*		*S1*		*S2*	
	Phase I	*Phase II*	*Phase I*	*Phase II*	*Phase I*	*Phase II*	*Phase I*	*Phase II*
ACTION/CHOICE:								
Generate Alternative	1	2	1	1	6	5	1	3
Audit Decision	8	14	5	26	22	29	5	19
Other Decisions	0	0	1	0	0	0	2	1
Decision Rule	3	3	0	0	0	1	0	0
Subtotal:*	12%	19%	7%	27%	28%	35%	8%	23%
TOTAL:*	100%	100%	100%	100%	100%	100%	100%	100%
TOTAL OPERATORS GENERATED	510	329	1,439	689	236	495	581	607

* Sums for Subtotals and Totals may be off by one or two percentage points due to rounding.

were case overview, planning workpaper, internal control summary, unaudited financial report, historical financial reports, supplementary financial schedules, and planned audit program. Given that any such partitioning of case information is likely to be somewhat arbitrary, the results are potentially limited.

Results revealed a number of differences in information acquisition between the seniors and managers. For example, the two seniors concentrated, on average, over 32 percent (S1 40.6 percent and S2 24.1 percent) of their information acquisition activities on the "Introductory" case materials. S1, in particular, often referred to case instructions and audit procedures. In contrast, the two managers spent, on average, only 12.5 percent (M1 17.6 percent and M2 7.3 percent) of their information acquisition effort on this introductory material.

This behavior is consistent with previous research on experts and novices. For example, Chi et al. [1982] found that physics experts have internal schemata (problem representations in memory) that allow them to identify, from their memory, the type of problem involved and to use these schemata to solve the problem. Novices, on the other hand, do not seem to have well developed internal schemata to help them solve problems. They must create problem discriminations based on the details of the problem they are dealing with. Also, see Gibbins [1984] and Waller and Felix [1984] for discussions of the role of experience in developing memory structures relevant to auditor decision-making.

The lack of a well developed, internal problem schemata would explain why seniors spent much of their information acquisition activity referring back to instructions and procedures presented in the introductory part of the case. Evidently, the managers, after reading the introductory material once, were able to access well developed internal schemata that provided the principles on which they could perform the rest of the case.

There also was a difference between the managers and seniors in terms of the goals underlying the information acquisition during Phase I. The seniors' information acquisition was strictly oriented toward obtaining the information needed to perform the task assigned (i.e., understand the client well enough to revise the audit program). While this goal was also important to the managers, much of their information acquisition activity was directed at getting a thorough understanding of the client, the nature of its business, and any business problems it faced. The many management letter comments made by the two managers are reflections of information acquisition oriented toward this latter goal. For example, both commented on the potential tax savings if the client was willing to switch from FIFO to LIFO inventory cost flow assumption. These differences in goals of information acquisition are probably reflective of the differences between auditors who are used to taking a managerial approach (managers) and those who are used to simply carrying out orders (seniors).

Auditors' Information Evaluation

Information is not just acquired, but must also be evaluated to determine its relevance and importance before it can be incorporated into decisions. Operators in the Information Evaluation category in Table 1 represent evidence of the auditors' information evaluation behavior. Protocols revealed six operations which were evaluative in nature. These operations ranged from evaluations to more tentative conditional judgments.

The category also includes behavior such as generating assumptions and queries as well as rationale for decisions (Decision Support Operator).

In examining the evaluative operators in Table 1, two results stand out. First is the substantial amount of evaluative behavior that took place. The percentage of operators involving information evaluation behavior ranged from 36 percent (M2 in Phase II) to 65 percent (S2 in Phase I). Evaluative behavior appears to take up most of the auditors' decision process activities. Also, note that the highest percentage of evaluative behavior involved the evaluation operator. The auditors were resolute in their evaluation of the case information. This is in contrast with Biggs et al. [1987] where, in an EDP Control evaluation task, a much higher percentage of the more tentative evaluative operators (i.e., conjecture, assumption, and queries) was observed.

The second important result concerns the auditors use of tentative evaluative operators. These tentative operators tend to be used when the auditor has some uncertainty about the information being evaluated. Uncertainty does not stop auditors from making decisions. They adapt their reasoning process to fit the uncertain circumstances [Norman and Bobrow, 1975]. In this study, the protocols show evidence that auditors adapted to uncertainty by making tentative judgments and assumptions during their reasoning processes.

Decision-making under uncertainty has been a much-studied phenomenon and, thus, it is important to link the above results to this literature. One possible reasoning process that is prevalent in the literature is probabilistic reasoning [e.g., Tversky and Kahneman, 1974]. Recently, in the artificial intelligence literature another approach has been proposed, in which the reasoning process is considered to be more qualitative in nature. For example, Doyle [1983] has proposed a model of reasoning by assumption and Cohen [1984] has proposed a model of reasoning by endorsements. Both models suggest that individuals deal with uncertainty by considering the conditions under which a particular outcome would occur with certainty. That is, the reasoning process is more like "A will occur if conditions B, C, and D are present" rather than a probabilistic approach, "There is a probability of 0.5 that A will occur."

Results of this study showed no evidence that auditors were using probabilistic reasoning processes. However, there is support in the protocols for the alternative approaches. The auditors, when faced with an uncertain situation, made assumptions and conditional judgments which allowed them to make decisions and evaluative judgments. Given that no manipulations were made to test the various theories of reasoning under uncertainty, one must be careful not to overstate the implications of this evidence. Nevertheless, when simply asked to think aloud, the protocols from the auditors showed no evidence of probabilistic reasoning.

Decision Behavior During Phase I

The auditors tended to use the following four step approach: (1) read through all or portions of the case, conducting a preliminary analytical review to identify audit problems (i.e., areas of potential audit concern) or audit "opportunities" (i.e., areas of little audit concern); (2) request analytical review information (usually financial ratios) to further investigate problems and opportunities found in step 1; (3) evaluate requested information to confirm problems and opportunities; and (4) adjust the audit

TABLE 2
PROBLEMS AND OPPORTUNITIES IDENTIFIED BY AUDITORS DURING PHASE I

	Auditor			
Problem or Opportunity Identified	*M1*	*M2*	*S1*	*S2*
Pacific Electric not on LIFO	X	X		X
Possible Inventory Obsolescence	X	X	X	X
Accounts Receivable Overstated	X	X	X	X
Accounts Payable increasing faster than inventory, possible liquidity problem	X	X	X	
Installations in Process overstated	X	X		X
Notes Receivable overstated	X			
Long Term Debt too high	X			X
Interest Expense too high	X	X		
Salary and Wages not controlled	X			X
Bad Debt Expense understated		X		
Insurance expense understated		X		
Acquisitions unclear		X		
Depreciation understated			X	
Sales Returns	X			
Potential Going-Concern Problem	X			
Totals	11	9	4	6

program based upon analytical review information from the previous steps. The above process suggests that analytical review was used as a diagnostic tool to help direct the audit function.

In terms of the problems and opportunities the auditors identified, two issues were important in this research. First was the question of whether or not the auditors identified the potential overstatement of accounts receivable which had required an adjustment in the actual company on which the case was based. Second was the question of whether auditors use analytical review as suggested in SAS No. 23 [AICPA, 1978] to identify *both* areas that should be subjected to increased audit effort (i.e., problems) *and* areas that can be subjected to reduced audit effort (i.e., opportunities).

Table 2 shows the problems and opportunities identified during Phase I. All auditors identified an extensive set of problems during their initial analytical review, with managers identifying substantially more than the seniors. Also, all auditors identified accounts receivable as being potentially overstated. Auditors identified the accounts receivable problem by noting that the growth of accounts receivable was more rapid than the growth of the allowance for doubtful accounts and the increases in the overdue accounts shown in the accounts receivable aging schedule. Thus, the auditors' performance met at least minimal expected standards.

In terms of their identification of both problems and opportunities, the auditor's performance is subject to some criticism. There is no evidence that any of the auditors used analytical review to identify areas where audit effort could be reduced. Moreover, there were some areas (e.g., accounts payable) that showed no unusual fluctuations and, thus, might have been viewed as an area where further tests of details could be reduced. While not conclusive, there is no evidence that auditors used analytical review to identify opportunities to reduce audit effort. More about this issue will be discussed in the following section.

Decision Behavior During Phase II

Decisions made during Phase II involved adjustments to the planned audit program. Phase II decision operators were coded in the protocols as audit decisions (ADs), generated alternatives (GAs), other decisions (ODs), and decision rules (DRs). The protocols were further analyzed to identify: (1) which audit procedure or procedures, if any, were affected by the decision; (2) what type of change was being considered; and (3) what reasoning or rationale could be linked to each action.

In all, there are some 532 actions summarized as to the type of change that was proposed and their underlying rationale. Although a number (80) of these actions were "editorial" in nature, the vast majority (422) involved explicit changes in nature, extent, or timing.

An analysis of the changes to the audit program was conducted to determine those that increased or decreased audit effort. Decreases were represented by simplifications in the nature of the work, moving the time closer to final, and decreasing the scope or extent of the work. Increases were represented by the opposite. Of the 422 changes to nature, timing, and extent on the audit program, only 19 were decreases, and 403 were increases or no changes. This result is consistent with earlier results that, during Phase I, the auditors identified problems, but no opportunities. Thus, at least in this study, the auditors did not use analytical review to reduce test of details.

It is difficult to determine if this is purely a case-specific finding or whether auditors simply do not get enough "comfort" from the analytical review procedures to reduce more traditional audit tests. In this study, analytical review evidence served primarily as "red flags" to identify areas of audit risk.

Decision Behavior: Errors

Identification of decision errors in a case as complex as Pacific Electronics cannot be done with precision. There are two primary bases upon which some assessments of decision errors can be made. First, the case was based upon an audit client and an audit adjustment was made to the accounts receivable. While this isn't a perfect criterion (i.e., the real world auditors may have been mistaken), it is a criterion that has "passed" an actual audit practice test. Thus, we can assess whether or not the auditors identified a problem with accounts receivable and what they decided to do. Second, we can compare managers and seniors. Based on protocol evidence of the reasoning behind decisions, knowledge of the auditing literature, and the *prima-facie* evidence that managers are more expert than seniors, some evidence on decision errors can be obtained.

With respect to identifying problems with accounts receivable, there is very clear evidence. All auditors identified accounts receivable as an area of primary audit concern. Furthermore, there is considerable agreement about the evidence that supported their conclusion. As indicated before, analytical review revealed that accounts receivable was increasing faster than the associated allowance account, and there was evidence of deterioration in the aging schedule. All auditors explicitly cited both sources of evidence.

While the auditors performed very well in terms of identifying the problem with accounts receivable, the decisions they made based upon identification of this problem revealed possible errors in judgment on the part of less experienced subjects (S1 and S2). In the discussion of information acquisition behavior, it was suggested that managers appeared to have internal memory schemata that are more developed than seniors and that this was consistent with evidence presented by Chi et al. [1981]. Further support for this conclusion is present in the decisions made about the revenue cycle. Here managers seem to apply a more complex and had deeper understanding of the problem of auditing the revenue cycle. The seniors made numerous increases in nearly all steps of the audit program for the revenue cycle. In contrast, the managers were much more selective in increasing audit effort on the steps. A particularly revealing decision involved confirmations. Both seniors increased the number of confirmations (extent), while neither manager increased this step. Subject M2 clearly states in the following protocols why he made no change:

301 The confirmation scope. I think would be the same.
302 Confirmation scope doesn't have anything to do with collection
303 Just has to do with propriety
304 and existence.

However, in Objective B which involves collectibility and valuation, subject M2 indicates a different decision based on analytical review evidence:

343 As far as scope changes there
344 Since we do have a deterioration (in Aging of Accounts Receivable), we want to look closer
345 I would say that in Step 6
346 Where we're discussing collectibility
347 Our scope . . . its difficult to say what our scope should be
348 Our balance is twice the size that it was in the prior year.

The above reasoning suggests a schemata that goes beyond the surface features of the problem of linking analytical review evidence with audit program changes. M2 recognized that confirmations would provide little insight about collectibility of accounts receivable. Rather, confirmations, a fairly expensive procedure, should be increased when problems of existence and propriety are involved. The seniors, perhaps having a more shallow understanding of the problem, increased audit work throughout the revenue cycle. The seniors' decisions are similar to those physics novices in the Chi et al. [1981] study whose reasoning reflected attention to the surface features in the problems and did not identify more complex and deeper relationships. Failure to adequately discriminate among steps could increase the cost of audits.

Limitations

There are several limitations regarding the task that have not been previously mentioned. While the task was based on an actual audit situation, there was only one situation. Thus, it is difficult to know to what extent the same findings would be obtained in another task. While the case was lengthy, it does not duplicate the complexity of actual audit situations. Thus, while some of the complex trade-offs between different audit procedures could be observed, others might be present in actual auditing situations. It is not possible to know how this limitation might have affected the judgments made by the auditors.

Some limitations apply to the verbal protocol methods. These limitations have been discussed at length in the literature (see Ericsson and Simon [1984, 1980]; Payne et al. [1978]; and Biggs and Mock [1983]). Nevertheless, a few bear repeating. Due to the time consuming methods involved with verbal protocol analysis (and the length of the case), the research involved only four auditors. It is difficult to know whether other auditors would have made the same judgments or exhibited similar decision processes.

Verbal protocols may not capture all of a subject's decision processes. There is an element of subjectivity in the coding of protocols. These effects were minimized by establishing coding rules prior to analyzing the protocols and by using more than one coder. The latter allowed the measurement of agreement and reconciliation of differences.

Taken as a whole the above limitations suggest that one must be cautious about generalizing the results of this study to audit practice. On the other hand, the results may be sufficiently reliable to suggest directions for future research.

IMPLICATIONS FOR FUTURE RESEARCH

Reasoning Processes—Dealing with Uncertainty

As discussed earlier, the results show that the auditors did not use probabilistic reasoning to manage uncertainty. Given its emphasis in the decision theory literature, it is important to understand why this and other studies [Biggs and Mock, 1983; Biggs et al., 1987] have not found any evidence of probabilistic reasoning in actual decision processes. Is it because auditors are not properly trained to use probabilities? Is it because auditors do not have the background knowledge to properly quantify uncertainty with probabilities? Is it because auditors do not find probabilistic reasoning to be an efficient or effective way to make decisions under uncertainty? Are the frequentist and Bayesian concepts overemphasized in the literature? Given the evidence discussed here and the difficulty humans have in dealing with probabilities [Joyce and Biddle, 1981; Tversky and Kahneman, 1974], answers to these questions could provide important insights about auditor decision-making.

Manager/Senior Differences—Decisions

All auditors identified the major problem imbedded in the case (potential overstatement of accounts receivable) and their adjustments to the audit program were consistent with the various problems they identified. However, the seniors, based upon finding a problem with accounts receivable during their analytical review, tended to increase the audit work throughout the revenue cycle. On the other hand, the managers were much more selective in the procedures that they increased. For example, seniors increased the number of confirmations, while the managers did not. This somewhat subtle difference in decisions may be attributed to the richer schemata of the managers. The seniors appeared to be responding to the surface features of the problem, whereas the managers made more subtle distinctions. This type of finding is consistent with differences between physics experts and novices.

This evidence of differences between managers and seniors underscores the importance of further research aimed at identifying the decision processes of auditors with different levels of experience. Evidence of differences in information acquisition and decision behavior between seniors and managers were linked to previous research. This evidence revealed not only that the more experienced managers seem to have more complete memory structures related to the audit problem, but also that these memory structures seem to allow a more efficient processing of case information (the managers seldom referred back to the case instructions) and they may have made audit program decisions that were more cost effective. While this latter conclusion is somewhat speculative (it is extremely difficult to assess cost effectiveness), it does suggest the need for more research on memory structures and experienced versus novice decision behavior.

Auditor Problem Identification During Analytical Review

The auditors in this study used analytical review to identify problems that would require further investigation. It was pointed out that while SAS No. 23 [AICPA, 1978] suggests that analytical review be used to identify both problems and opportunities, our subjects did not use analytical review to identify opportunities to reduce other audit tests. This finding was present even though there appeared to be accounts that showed no unusual fluctuations and, thus, were candidates for reduced audit work. Research to investigate why this occurred may be quite insightful. Is it because auditors need more "solid" evidence before they will reduce test of details? If this is the case, then analytical review may not provide the increased audit efficiency that has been the hope of many auditors.

APPENDIX A
OPERATORS AND OPERATOR DEFINITIONS

Operator	*Notation*	*Brief Definition*
Task Structuring Operator		
1. Set Goal	SG	Assigned when the subject specifies a goal to be accomplished in performing the task.
Information Acquisition Operators		
2. Information Search	IS	Assigned when the subject searches the case materials for specific pieces of information (directed search) or searches following some systematic pattern (usually sequential search).
3. Direct Reading	R	A particular type of search operator assigned when a subject reads directly from the case materials.
4. Algebraic Calculation	AC	Assigned where subject makes a mathematical calculation in order to obtain new information about the task.
5. Information Retrieval	IR	Assigned when subject retrieves a previously stored piece of information from external memory (i.e., notes, calculations) or internal memory.

APPENDIX A—*Continued*

OPERATORS AND OPERATOR DEFINITIONS

Operator	*Notation*	*Brief Definition*
Analytical/Inferential Operators		
6. Assumption	AS	Assigned when subject generates an arbitrary (unspecified) fact about the case.
7. Conditional Judgment	CJ	Assigned when subject draws a conclusion (prediction) which is speculative or predictive in nature. Usually has a degree of uncertainty present.
8. Evaluation	E	Assigned when subject makes a definite judgment about the task based on some conditional explicit or implicit criterion. No uncertainty is present.
9. Comparison	CN	Assigned when a subject compares two items such as a comparison of account balances between years.
10. Decision Support	DS	Assigned when a subject provides rationale (premises) to support a decision, recommendation, or alternative.
11. Generate Query	GQ	Assigned when subject raises a question.
Action/Choice Operators		
12. Generate Alternative	GA	Assigned when subject generates an alternative.
13. Audit Decision	AD	Assigned when a subject reaches a definite decision concerning the specific audit task (e.g., "revise the planned audit program").
14. Decision Rule	DR	Assigned when subject specifies a method (including heuristics) of reaching a decision.
15. Other Decisions	OD	Assigned when a subject reaches a definite decision that is not an AD. Typically OD operators involve making what in audit tasks are management letter comments.

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2. To recommend amounts of stipends.
3. To rank applications and to transmit the ranking to the trustees of the fund.

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DOCTORAL CONSORTIUM COMMITTEE

Charge: 1. To plan the 1988 Doctoral Consortium.
2. Upon approval and funding, to arrange to have the consortium conducted and administered.
3. To report on its results, effectiveness, and recommended changes by November 1, 1988.

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Dave Larcker, University of Pennsylvania
Steve Penman, University of California
Rick Antle, Yale University
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DOCTORAL PROGRAMS COMMITTEE

Charge: 1. To carry out the plans made for the 1989 Doctoral Programs Conferences.

2. To evaluate prior Doctoral Programs Conferences and recommend to the Director of Education whether or not this program should be continued and, if so, how it might be improved. Funding of future committees and conferences should also be studied.

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Paul Newman, University of Texas at Austin
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Charge: To evaluate selected discussion memoranda and exposure drafts related to Financial Accounting in the private sector as they are released by the Financial Accounting Standards Board, and to respond to the FASB in writing and by appearing at public hearings if necessary.

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FUTURE STRUCTURE FOLLOW-UP COMMITTEE

Charge: To follow up and explore the implementation issues associated with the recommendations of the Reports of the 1986-87 Changes in Accounting Education Committee, the Future Structure Follow-up Committee, and the Professional Environment Committee, each of which was asked to address some aspect of the Report of the 1986 AAA Committee on the Future Structure, Content, and Scope of Accounting Education.

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2. To assist the Executive Director with the arrangements and the distribution of necessary materials for the visits.

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MINORITY FACULTY DEVELOPMENT COMMITTEE

Charge: 1. To explore ways in which minority candidates for doctoral programs can be identified by doctoral programs in accounting.

2. To examine minority recruitment programs of other professional organizations, such as the AICPA programs.

3. To explore ways in which potential minority candidates can be encouraged to apply to accounting doctoral programs and to pursue professional careers in accounting education.

4. To explore ways in which to encourage the development of minority faculty members.

Chairperson: Brenda Birkett, Southern University
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Don Haley, Cleveland State University
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MODEL LIBRARY COMMITTEE

Charge: To examine the criteria and nature of the process of a "model library" with respect to accounting. The examination will consider the variety of demands placed on a library by different types of accounting programs (e.g., undergraduate, MBA, professional school, and doctoral). It will explore the effects of current and potential technology (e.g., computer-based library systems). It will also consider research demands, as well as teaching demands, upon a library. It further will consider that a model library reflects the observation that accounting education includes an integration of accounting with related fields.

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Charge: To plan the 1988 New Faculty Consortium, to arrange to have the Consortium conducted and administered, to report on its results and effectiveness, and to recommend changes if deemed desirable.

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Bruce Baldwin, Portland State University
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NOMINATIONS COMMITTEE

Charge: To select a list of nominees to AAA offices for election by the membership in August 1988.

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NOMINATING COMMITTEE: NOTABLE CONTRIBUTIONS TO ACCOUNTING LITERATURE AWARD

Charge: To nominate to the AICPA-AAA Notable Contributions to Accounting Literature Committee up to five selected books and articles each from those identified by the Screening Group as potentially notable accounting literature. Each nomination should be accompanied by an explanatory discussion of why the work should be considered to be a notable contribution.

Chairperson: Robert Magee, J. L. Kellogg Graduate School of Management
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Robert May, University of Texas at Austin
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Ross Watts, University of Rochester
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PEAT, MARWICK, MAIN AUDITING PRACTICE & RESEARCH SEMINARS COMMITTEE

Charge: To assist Peat, Marwick, Main & Co. in the conduct of the auditing seminars series.

Chairperson: H. Dewey Ward, Michigan State University
Gerald Smith, Iowa State University

PROFESSIONAL EXAMINATIONS COMMITTEE

Charge: 1. To evaluate the CPA and examination to determine the appropriateness of the form and content of the exam.
2. To evaluate the impact of the CPA examination upon accounting education and curriculum.

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Anthony Krzystofik, University of Massachusetts
Martin Taylor, University of South Carolina
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Charge: To assist the President of the Association in developing the technical program for the 1988 annual meeting.

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RELATIONSHIP BETWEEN THE PRACTITIONER AND ACADEMIC COMMUNITY COMMITTEE

Charge: To explore areas of common interest between public accounting and the academic community and ways in which the academic community can most effectively affect the practitioner community and conversely. The charge will involve a consideration of means of improving communication between the two groups, an evaluation of existing means, an evaluation of the role of the academic community in policy setting, and other related issues.

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Gerald Searfoss, Touche Ross & Co.
J. Michael Cook, Deloitte Haskins & Sells
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Barry Lewis, University of Colorado
Abbie Smith, University of Chicago
Frederick Choi, New York University
Robert Freeman, University of Florida
Robert Freeman, University of Chicago

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Charge: To identify works of exceptional merit from books and articles that meet the guidelines established by the Executive Committee.

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Amin Amershi, University of Minnesota
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SECURITIES AND EXCHANGE COMMISSION LIAISON COMMITTEE

Charge: 1. To determine what aspects of SEC accounting are included in the accounting curricula of appropriate colleges and universities.

2. To make recommendations as to what SEC processes and pronouncements should be included in designated accounting curricula, including the identification of ways of implementing SEC topics into specified curricula.

3. To continue to develop and implement means for providing input and assistance to the SEC by academic accountants.

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Lawrence Salva, Securities & Exchange Commission
Victor Bernard, University of Michigan
Wesley Andrews, Securities & Exchange Commission

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Charge: To select the 1987–88 recipients of American Accounting Association grants and determine the amounts of their awards.

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Talmadge C. Tillman, Jr., California State
Philip Siegel, San Francisco State University

"THINK TANK" COMMITTEE

Charge: To explore on a relatively unconstrained basis, innovative ideas and projects which might enhance the effectiveness of the AAA in any aspect. Initially, the Committee is not to be primarily concerned with issues of implementation, although it is not precluded from introducing such consideration if it wishes. The range of discussion is to be unlimited in scope, initially unfettered by the constraints of practicality or political acceptability. Its primary charge is to be creative and innovative. Beyond that, the charge of the Committee is that it has "no charge."

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Joel Demski, Yale University
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Rita Hull, Virginia Commonwealth University

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Charge: 1. To explore ways in which women's professional careers can be enriched so they may fully reach their full potential as teachers and researchers.

2. To examine how other professional organizations pursue such goals.

3. To explore ways in which to encourage the development of women faculty members.

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BOOK REVIEWS

Richard P. Brief, Editor

Editor's Note: Books for review should be sent to Professor Richard P. Brief, 520 Tisch Hall, College of Business and Public Administration, New York University, New York, NY 10003.

AMERICAN TAXATION ASSOCIATION, *Tax Planning for Educators 1987* (Sarasota: American Accounting Association, 1987, pp. 90, $6.00 members, $8.00 nonmembers).

This book is the revision of a document by the same title which was published in 1979. For the most part, the book is well written, and it will be a valuable reference for educators planning their financial affairs and filing tax returns.

The book provides a concise description of many provisions of the federal tax laws which are likely to be of concern to professionals in all areas, with some emphasis on the particular needs of employees of colleges and universities. Among the topics covered are retirement benefits, insurance programs, scholarships, fellowships and awards, tax consequences of relocation, professional expenses and reimbursement, and other fringe benefits.

The work would benefit from increased coverage of the IRS audit process and a practical description of the appeals process within the IRS available to the taxpayer. Research and development tax credits, which may be relevant for faculty consulting projects, were entirely omitted. Furthermore, several potentially important details for applying tax rules are missing. Some examples of neglected points are the circumstances and amounts for nontaxability of employee discounts, alternative valuation of on-campus housing to determine taxability of rent discounts, and deductibility of moving costs for employment shorter than 39 weeks.

While the subject matter is concerned with the tax problems of university employees, regardless of their area of expertise, some sections of the book use language which is not likely to be understood by educators without business backgrounds. For example, there is a statement that "costs capitalized prior to 1987 were amortized against revenues under the income forecast method," but amortization, capitalization, and the income forecast method are not defined. Also, while the book is well organized by subject areas of concern to educators, there is no index.

In some of the areas where the authors go beyond a description of the tax laws, certain conclusions are questionable. The statement is made that "from an equity standpoint, tax credits are more desirable than tax deductions." While it is true that deductions are more valuable to taxpayers in higher brackets, it does not necessarily follow that credits are more equitable since the ultimate distributional effects of credits and deductions are unresolved. Another section states that "since the university can ordinarily obtain funds at lower costs than individual faculty members, a school should be able to construct residential housing and lease it to faculty members at fortuitous prices." While there is some obvious justification for this statement, there are factors other than the cost of capital which may make the business of faculty housing undesirable for universities.

Despite these criticisms, *Tax Planning for Educators 1987* is a well done and much needed update of the 1979 version. It is a useful first reference on tax problems for any educator.

CHRISTOPHER R. PETRUZZI
Assistant Professor of Accounting
New York University

WALTER GEORGES and ROBERT W. MCGEE, *Analytical Contribution Accounting* (New York; Westport, CT; and London: Quorum Books, a Division of Greenwood Press, Inc., 1987, pp. xii, 254, $39.95).

Walter Georges and Robert W. McGee selected a very interesting topic for their book—the interaction of cost accounting and pricing policy. The goal of this book is stated in the opening line of the cover as "Using practical examples and simple language, this book develops an accounting system that is a new and functional key to making product pricing decisions." Unfortunately, readers, especially the targeted professionals concerned with accounting systems and pricing policy, will be disappointed. The proposed "analytical contribution accounting" is neither well-presented, based upon the newest thinking about pricing for business decisions, new, nor a functional key.

The relationship between product costs and pricing decisions has always presented problems for both theoreticians and practitioners. The authors' documentation of these problems, like the rest of the book, is stilted and uses unnecessary opening clauses and Latin phrases. Some examples, such as the two page description of the Belgium building industry, seem to lack relevance to the main issue. Many of the examples are formulas rather than practical examples.

Major weaknesses for a work proposing a new method are the lack of references to current literature and the lack of a description of current practice. Product differentiation is extensively covered in Chapters 3 and 8 without reference to, or use of, Michael Porter's work in industrial economics and management (such as *Competitive Strategy*, Free Press, 1980 or *Competitive Advantage*, Free Press, 1985). The extensive discussion of cost allocations does not refer to recent widely read American academic literature, such as Arthur Thomas' monographs (*The Allocation Problem in Financial Accounting Theory*, Studies in Accounting Research No. 3, American Accounting Association, 1969, and *The Allocation Problem: Part II*, Studies in Accounting Research No. 9, American Accounting Association, 1974) and J. L. Zimmerman's article ("The Costs and Benefits of Allocations," THE ACCOUNTING REVIEW, July 1979, pp. 504-522). The most extensively quoted marketing text has a publication date of 1969. Little description of current practice is given. The description of the value basis for United States firms (p. 51) for pricing decisions is based upon a 1953 study, which cannot be determined without reference to the footnote (p. 214).

"Analytical contribution accounting" is often referred to by the authors as new and the "golden mean" between the rejected full cost and direct cost methods. The development and examples seem, however, to be what most accountants have termed "contribution analysis" or "relevant costing." That is, individual products must cover their direct costs (creating what the authors term a "price floor"), and price-demand interactions must be considered in setting selling prices so that full costs and cash outlays are covered. Accounting literature and management cases illustrating these concepts have existed for some time. The development of the various classifications for "analytical contribution accounting," while worded somewhat differently, merely documents again the numerous decisions required of accountants and managers to utilize these concepts. The "golden mean" is that neither cost concept can be used to the exclusion of the other, and that an answer will lie between the two. Chapters 16 and 17 do provide a comprehensive summary of the issues and some interesting examples, especially the two examples on multi-product firms and joint product firms.

The authors document extensively that costs are only one of many factors to be considered in pricing decisions; they never point out how "analytical contribution accounting" helps in considering the interaction with other factors. Two additional deficiencies were noted. First, price leaders are not covered as active price-setters in the discussion of active versus passive pricing policy. Second, the authors' statement "Consequently, differences in selling prices can only be maintained when they are clearly tied to cost differences" (p. 132) seems to violate economic and marketing theory—where selling prices are related to actual or perceived characteristics of the good or service purchased. Much of current management literature seems dominated by recommendations to be the low-cost producer of commonly priced products or changing the product (or at least the perception of product by the purchaser) where the change in selling price is greater than the change in the cost.

This book could have been shorter and more interesting if it had focused strictly on the interface of cost accounting and pricing policy. The extensive development of pricing policy in Chapters 1-7 was not used in the rest of the book. The core of the book is Chapters 16 and 17 which can be read with little reference to the earlier material. While not new, it is comprehensive and provides some interesting examples.

RAY G. STEPHENS
Associate Professor of Accounting
The Ohio State University

PAUL A. GRIFFIN and RICHARD P. CASTANIAS, II, *Accounting for the Translation of Foreign Currencies: The Effects of Statement 52 on Equity Analysts*, Research Report (Stamford, CT: Financial Accounting Standards Board, pp. viii, 112, $16.00 paper-students, $20.00 paper-other).

This book reports on the results of a study designed to examine the impact of the change in foreign currency translation accounting mandated by FASB Statement No. 52, *Foreign Currency Translation* on the ability of analysts to understand and forecast earnings of multinational firms. The objectives of the study were to determine whether analysts understood Statement 52 and how they use information prepared under the requirements of the standard in financial analysis. In addition the study examined the impact of Statement 52 on forecast revision behavior and forecast accuracy.

The study consisted of two essentially independent parts. The first part reports on a series of interviews with 49 analysts. The interviews attempted to determine from the analysts the extent of their understanding of the objectives and consequences of Statement 52. The second part of the study involved an empirical analysis of earnings forecasts of analysts obtained from the I/B/E/S tape produced by Lynch, Jones & Ryan. The objective of this part of the study was to determine (1) whether increased forecast revision behavior was associated with the issuance of the new standard, and (2) the impact of Statement 52 on analysts' earnings forecast accuracy.

Much of the book is devoted to reporting the results of the interviews with equity security analysts. The comments of the analysts provide some revealing insights into how analysts use accounting data. In general, the analysts seemed to believe that the market would respond to a change in reported earnings regardless of the cash flow effects.

Few analysts characterized themselves as having a very good understanding of either Statement 8 or Statement 52. The analysts noted that it was difficult to distinguish changes in hedging behavior made for purposes of protecting the company from exchange fluctuations and those intended to hedge paper losses. A large number (75 percent) of the analysts indicated that they believed that some companies implemented Statement 52 early to boost earnings. One analyst commented

> I don't know a single one of my companies that does not take every possible opportunity to hype earnings. I am sure, therefore, they sat down and analyzed all the various choices and they picked the year that made everything look the best (p. 55).

The authors of the study draw no conclusions about the implications of analysts' views towards Statement 52. The feeling I got after reading the book was that there is a remarkable void between what academic researchers think is happening when we observe evidence of market efficiency, and what analysts (who some would argue make the market) think is happening. The analysts repeatedly asserted in various contexts that what really mattered as far as the stock market is concerned is the bottom line, and how you get there is of much less concern.

The second part of the study focused on an empirical assessment of the ability of analysts to forecast earnings under Statement 52. Using the I/B/E/S data base, monthly forecasts of 355 companies reporting under Statement 52 and 195 control firms were obtained for the period from January 1979 to June 1984. The results indicate that the relationship between forecast revision behavior and the earnings impact of the change was positive and significant for the period surrounding the enactment of Statement 52. The authors conclude that this supports the hypotheses that Statement 52 led to an increase in forecast revision behavior around the time of the change.

The results here are difficult to interpret because the regression coefficients were generally positive and were significant for several other periods as well. Hence, it is not really clear whether the positive relationship observed between forecast revisions and the earnings impact of the change is due to SFAS 52 or to some other factor such as a relationship between forecast revisions and change in the dollar relative to foreign currency. This may be the case if the income effect of the change surrogates for the relative importance of foreign operations to a company.

Tests were also run to determine the impact of Statement 52 on forecast accuracy. Time-series and cross-sectional regressions were used to determine the impact of SFAS 52 on forecast errors. The results provide some support for the hypothesis that forecast errors decreased slightly subsequent to its enactment.

I enjoyed reading this book. It provides some intriguing insights into the manner in which financial analysts use accounting information both in general and, more specifically, with regard to Statement 52 disclosures. The portion of the book which focuses on analysts' forecast errors also reports some interesting findings. The book is worthwhile reading for anyone who is interested in foreign currency accounting or analysts' behavior. I think that it could have been improved if the interviews had been somewhat more structured and tied to the empirical analysis of aggregate analyst behavior.

FRANCES L. AYRES
Peat Marwick Research Fellow
Assistant Professor
The University of Oklahoma

Harmonization of Accounting Standards (Paris: Organisation for Economic Co-operation and Development, 1986, pp. 146, $22.00 paper).

This book reports on a conference organized by the OECD in April 1985. Its subject was harmonization, and the participants were international, influential, and drawn from several fields. The book suffers from extreme forms of the problems of any "proceedings": (i) lack of quality control, (ii) lack of "harmonization" (!) of chapter length, style, and content, (iii) too many authors (42 authors or sets of authors in 146 pages), and (iv) excessive introductions, summaries, etc., in order to publish contributions from important chairmen.

The first section looks at different preparers and users. Ralph Walters (U.S. State Dept.) notes that preparers and users seem keen on international harmonization, whereas standard-setters are holding back. This naively fails to notice that any particular preparer would become less keen if *he* had to do something more, or different, as a result of harmonization (p. 18). Allan Cook (Shell) usefully points out that international harmonization could leap forward if certain EEC member states would take the opportunity offered by the Seventh Directive to allow group acccounts to be based on non-tax rules, even if individual company accounts remain tax-based (p. 23).

The trade union view (including a later paper) seems simultaneously idealistic and hopelessly confused. Information must follow "strict accounting and reporting standards," yet must reflect "economic reality rather than legal form," yet prohibit "prudence, materiality, and flexibility," and be based on strict historic cost (including the temporal method of translation) (pp. 27, 128, 129).

The contributions from the French statistical institute (INSEE) and from the Centrale de Bilans concern purely internal national harmonization, which confuses the issue (pp. 31–34). The representative of the international analysts calls for the separation of tax accounts from commercial accounts (p. 37). This is a frequent theme (though not from any German contributors!); and it is later said that international progress is being made, though no evidence is offered (p. 101).

The next section contains several summaries of national standard setting. These are short, dry, and well-known because of textbooks; and they are now rather out-of-date. However, they are from authoritative authors. I do not believe the German Director of the Ministry of Justice when he tells us that the 1965 Companies Act corresponds "more or less to the provisions of the Fourth and Seventh Directive." He also misleads us when he implies that "all merchants" followed the Act for accounting; in fact, nearly all of them had no audit or publication requirements at all. It is also daft to say (p. 58) that it is an advantage that tax is based on the principles of the commercial balance sheet, when it is really the other way round (which is a disadvantage, as is noted by several other contributors).

Donald Kirk (FASB) provides a refreshingly realistic and sensitive review of the difficulties of international harmonization from a U.S. point of view. Paul Rutteman provides a brief summary of the workings of the Groupe d'Etudes. This is hard to find elsewhere; but of course the Groupe has disappeared as such from the end of 1986.

There are then some brief but authoritative summaries of the work of the OECD, the UN, and the African Accounting Council. These are followed by some very fragmented reports of discussion groups.

Nowhere is it fully recognized that harmonization may actually be *bad* because it would do away with international differences that have grown up for good economic and institutional reasons. Thousands of companies might be pushed towards inappropriate (probably Anglo-American) accounting merely so that a small minority of internationally operating or traded companies could be more easily compared.

All in all, there is not much here to surprise a specialist in international accounting. There are some new insights and some examples of well-collated facts. What is particularly interesting is that a speaker cannot hide his cultural background irrespective of the profession he represents: Dutchmen argue for current costs, Germans argue for the temporal method and strict rules, and Britons want de-coupling of tax and accounting. Incidentally, to an Englishman, the French seem to write with flowery elegance, the Germans with impenetrable structure, and so on.

CHRISTOPHER W. NOBES
Deloitte Haskins & Sells
Professor of Accounting
University of Reading, England

WALTER HAUSDORFER, *Accounting Bibliography* (Palo Alto: Bay Books, 1986, pp. xiii, 512, $31.60).

Accounting historians have not been hesitant in compiling bibliographies. Perhaps this is because, as Yamey comments in his Introduction to the book under review, "Lists and listing come naturally to accountants" (p. vii). There are well-known bibliographies of primary works by Cerboni (in Italian), Hagers (Dutch), Reymondin (French), and Thomson and Yamey (English). These were preceded by the list appended to Benjamin Franklin Foster's *The Origin and Progress of Book-keeping*, published in London in 1852. Other writers have produced bibliographies—both general and specialized—of secondary works on accounting history, some of which, e.g., Pryce-Jones and Parker's *Accounting in Scotland* (1976), provide both annotations and locations for the books listed.

It is a strength of Hausdorfer's work that it contains several bibliographies of different types. The longest (pp. 13–271) is a list of primary printed works and manuscripts in alphabetical order. Annotations are provided for some of the entries. Locations are given for libraries in the U.S.A., the U.K., the Netherlands, Belgium, Germany, Italy, France, Spain, Hungary, Denmark, and Ireland. Few European works after 1801 are included but American works are given up to 1910. The remainder of the book comprises a list of accounting and bookkeeping periodicals started before 1910 (pp. 272–278); a chronological index to the printed works and manuscripts (pp. 279–323); a list of bibliographies and biographies (pp. 324–330); a bibliography, with some annotations, of works on accounting history (pp. 331–471); and a subject index (pp. 472–512).

The weakness of Hausdorfer's book is that, through no fault of the author or publisher, it does not take account of the considerable scholarship which has been devoted to accounting history during the last quarter century. This is because the work was completed in 1961 but was at that time unable to find a publisher. Walter Hausdorfer (1898–1970) was a librarian at Columbia University, New York and at Temple University, Philadelphia. It is his posthumous good fortune finally to achieve publication through the entrepreneurial initiative of accounting historian A. van Seventer, the man behind Bay Books. Although Hausdorfer's bibliographies inevitably overlap to some extent with those previously published (for all bibliographers of neccessity depend in part and build upon the works of their predecessors) they do contain additional material (including, as Yamey notes, a good listing of the writings of P. Kats) and their publication, although belated, will be warmly welcomed by serious students of accounting history.

Like all bibliographies, this one is in places incomplete. For example, whereas W. T. Baxter's papers on early American accounting in THE ACCOUNTING REVIEW, April 1946, and in Littleton and Yamey, *Studies in the History of Accounting* (1956), are recorded, his important book *The House of Hancock* (1945) has been missed. There are inevitably one or two mistakes. *The Accountant*, for example, is inadequately described as the "Organ of the Institute of Chartered Accountants" and the first volume of Gee & Co's *Accountants' Journal* was not published in 1833 (p. 272). Karpinski, correctly spelled on p. 393, becomes Karpinsky on p. 508.

Bibliographies are meant to be used rather than read, so one way to test them is to pose questions. One which I have tried out on the present book is: what literature is there on what might be called accounting hardware before the computer? A glance through the subject index produced the following headings: Accounting—Loose-Leaf; Accounting—Mechanical Aids; Horizontal Ledger; Loose-Leaf Books; Moon-Hopkins Billing and Bookkeeping Machine; Pascal, Blaise; Typewriters; and Wax Tablet Accounts. From these, references can be found to a number of useful books and articles which would otherwise have been hard to find.

It is a pity that Hausdorfer's book could not have been published in 1961. It is still well worth having, in spite of all the material which has since become available.

R. H. PARKER
Professor of Accountancy
University of Exeter

HENRY P. HILL, *Accounting Principles for the Autonomous Corporate Entity* (Westport, CT: Quorum Books, a Division of Greenwood Press, Inc., 1987, pp. xii, 144, $35.00).

Almost half a century ago, George O. May authored a volume subtitled *A Distillation of Experience*. At that time May was senior partner of Price Waterhouse & Co. Now, Henry P. Hill, who became a staff accountant at Price Waterhouse (P.W.) at about the same time that May wrote his book, has prepared a monograph on accounting principles that draws on his experience during the years following George May. Henry Hill's experience is a rich and varied one. After many years as an audit partner at P.W., he served as National Director of Accounting and Auditing Services for that firm from 1969 to 1976. He describes those years as "probably the most hectic seven years the accounting profession of the United States has ever experienced." Brief stints on the faculty at Dartmouth and N.Y.U. followed before Hill became the founding editor of the *Journal of Accounting, Auditing & Finance*. He has recently retired from that position.

The title of the book indicates its emphasis precisely. Hill is concerned almost exclusively with the autonomous corporate entity. He feels that many (most?) of the major problems of accounting principles determination could be solved by a thoroughgoing acceptance of the "entity concept" of accounting. Hill's "entity concept" goes far beyond what most supporters of the entity theory (as opposed to the proprietary theory) espouse. He views all long-term commitments to the corporation as capital and only short-term items as liabilities. As a result, all payments to or claims of long-term capital contributors are viewed as distributions of income rather than as expenses (determinants of income in his words).

The capital section of the balance sheet he proposes would include the total unfunded pension liability, deferred income taxes, capital leases, all bonds, and minority interest in subs as well as the traditional preferred stock, common stock, and retained earnings. He proposes a title such as "Sources of Capital" for this section of the balance sheet.

The proposed income statement would have its title expanded by adding the phrase "Appended Allocation of Net Income." The income statement portion would end with a figure labelled "Net Enterprise Income" which would be the net of revenue and non-operating income less all expenses as now reported *except* for those reported as income allocations. The items reported as income allocations would be pension costs, deferred taxes, interest portions of capital lease accruals, all interest on bonds and other long-term borrowings, and minority interest in income of consolidated subsidiaries as well as dividends. (Income taxes are treated as a determinant of enterprise income rather than an allocation of it.) The total of these income allocations subtracted from net enterprise income would give the change in retained earnings for the period. That number is, of course, equal to the change in retained earnings as now conventionally reported.

The entire justification for Hill's approach is his view that the modern corporation has "an identity completely separate from the characteristics or personalities of its owners." It is an "autonomous corporate entity," not only separate from its stockholders, but independent of their interests and wishes. I read this statement on the same day that the Allegis breakup was being announced as the climactic example of a large number of recent restructuring and divestitures. Perhaps the autonomous corporation is no longer as autonomous as Hill believes.

Hill's views on recording capital, and related allocations, are not entirely new ones. Maurice Moonitz was once reported to have said, "Drat those ancients, they have stolen all our ideas." Thus, Robert Jaedicke and Carl Nelson in 1960 (The Accounting Review, p. 281) suggested that deferred taxes "be shown as part of the stockholders' equity section of the balance sheet as loans from Government or perhaps subsidies from Government." Perry Mason and I in 1953 (*Fundamentals of Accounting*, p. 165) said, "it seems appropriate to insist that net income should be defined in terms of the business entity, the operating unit, and that interest on bonds and other such obligations is logically not a determinant of net income, but a distribution" of it. The Jaedicke and Nelson view on deferred taxes never took hold and in a later edition of out text (1975) we recognized that the notion of interest treated as a distribution was not gaining acceptance and reluctantly agreed to describe it as an expense.

Hill, without noting these early proposals, carries the notion of the autonomous corporation to its logical extreme. His entity concept is ably defended in the text, but I see little hope of its ever being implemented. It is interesting to see one who was a noted practical, practicing accountant suggesting a theoretical concept of much merit, but finding most academics and virtually all practicing accountants unwilling to accept the concept.

The high quality of the writing is marred by an occasional slip. Thus Pacioli's *Summa* is described as being published "in the mid-sixteenth century" (p. 4) rather than in the actual date of 1494. In the next sentence, there is reference to "three hundred years of application" when the number should more nearly be five hundred. (1994 will mark the quincentennial of Pacioli's opus.) On page 45 Hill mentions a Mexican law forbidding foreigners to own more than 49 percent of locally incorporated companies. Yet, two pages later in a major hypothetical example he describes a Mexican corporation that is 60 percent owned by a United States corporation.

Hill's recommendations are sweeping and controversial. They are clearly and well presented, aside from an occasional minor slip. They deserve the consideration of every accountant concerned with the development of basic concepts of financial accounting. In the end I doubt, however, that his suggestions will have much practical effect. It's a good try and I am glad he made it.

SIDNEY DAVIDSON
Arthur Young Distinguished Service
Professor of Accounting
The University of Chicago

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HAYDN JONES, *Accounting, Costing, and Cost Estimation* (Cardiff, Wales: University of Wales Press; distributed in the U.S.A. and Canada by Humanities Press, Atlantic Highlands, NJ, 1985, pp. ix, 285, $45.00).

This book traces the development and use of accounting data in Welsh industrial concerns during the eighteenth and early nineteenth centuries, a period of enormous economic change commonly referred to as "the industrial revolution." Haydn Jones, a retired senior lecturer in the Department of Business Administration and Accountancy, UWIST, Cardiff, joins the ranks of accounting historians who document the origins of management accounting using historical records of companies, not historical publications about accounting. Jones maps unexplored terrain in early British company accounting history using the rich holdings of original documents and industrial records that Welsh libraries and archives possess. In a foreword to the book, Basil S. Yamey notes that Jones' work is not "a missing small piece to fit into an otherwise virtually complete and comprehensible historical picture. Rather, it is a pioneering exploration, in depth, of what has been a large tract of virtually unknown territory."

As often is the case with "pioneering explorations," this book lacks focus and organization. The author never comments on the distinction between costing and cost estimation that is implicit in the title of the book. Nor does he take the opportunity to speculate about the different purposes for which companies seemed to compile cost information. Welsh companies evidently used accounting information for various purposes such as controlling operations, evaluating product prices, and judging alternative investment proposals. Moreover, it is interesting to learn that this information was not developed by accountants, but "by those of scientific bent and talent who were turning to trade and industry in the hope of making money." Too often the author drops his tantalizing observations about the architects of these historical records and discusses "accounting" features of the records. He views the records through a twentieth-century accountant's eyes, commenting frequently on their adherence to canons of double-entry procedure and considering whether the cost accounts "integrate" with the financial accounts.

Accountants trained since World War II tend to view management accounting information as a by-product of the financial accounting process. Perhaps that explains why Jones does not pay particular attention to unusual uses of information two hundred years ago that managers today would be wise to emulate. For instance, cost of production in an eighteenth-century Welsh mining company's records included selling and distribution expenses (p. 22); another company kept records of profit by mine site, but only in the proprietors' books—records kept at the mines tracked only labor costs (p. 21); a report from 1730 comments on the trade-off between production costs and product quality (pp. 26-32); Welsh companies with diverse multiple activities seem to show an interest in return on investment calculations a century before DuPont uses ROI in the United States (p. 72). In every instance managers apparently compiled this information to facilitate planning or control of internally-coordinated activities. They were not constrained by canons of financial accounting.

Jones reports in great detail—some might say too much detail—the information found in company records. Specialists in accounting history will appreciate the long passages reprinted from historical company accounts. But general readers would have gained if the author had added a few more interpretive paragraphs of his own. It is difficult to read verbatim transcripts of eighteenth-century text, much less to understand contemporary references to arcane production methods. And it is frustrating not to know the date when an account was prepared, as happens too often in this book. Nevertheless, the book provides a rich lode of source material for the intrepid reader. Particularly interesting is correspondence transcribed from company letter books that pertains to information found in the accounting records.

Although Jones makes scattered references to previous works by accounting historians, his book really stands alone as a study of particular company records. The book seldom mentions existing debates about the origins of management accounting. Most glaring is the absence of any reference to Sidney Pollard's study of accounting in the early industrial revolution. This is an unfortunate omission because Jones has uncovered much evidence refuting Pollard's main conclusion that accounting was not an important management tool in early industrial organizations. It remains for someone—perhaps Jones himself—to link the extensive archival research in this book to existing scholarship in management accounting history.

H. Thomas Johnson
Dwight J. Zulauf
Professor of Accounting
Pacific Lutheran University

J. S. H. Kornbluth and G. R. Salkin, *The Management of Corporate Financial Assets: Applications of Mathematical Programming Models* (London, Orlando, San Diego, New York, Austin, Boston, Sydney, Tokyo, and Toronto: Academic Press, Harcourt Brace Jovanovich, Publishers, 1987, pp. xi, 348, $40.00).

This text deals exclusively with the applications of mathematical programming to relevant topics in managerial accounting and managerial finance. Throughout the presentation, the authors apply linear programming (LP) and sensitivity analysis in solving different problems. They also broaden the coverage and discuss goal programming, multiple objective goal programming, and network flow models. The authors draw upon the research work of others and augment it with new approaches to illustrate the usefulness of the information generated through the application of these models. This profound work will stimulate further discussion and more conceptual development from instructors and students in the classroom.

The first five chapters provide valuable material for an advanced management accounting course. Chapters 1 and 2 examine LP and sensitivity analysis in financial planning. The network flow model is introduced as an alternative to LP. An evaluation of both alternatives using a cash management problem shows the merits of each model. Chapter 3 extends the LP model to multiple criteria decision making by developing goal programming (GP) and multiple objective linear programming (MOLP). A comparison between these two models for different cases demonstrates the advantages of MOLP over GP in allowing the decision-maker to choose the solution that is appropriate to the weights assigned for the trade-offs between the various objectives. This on-line interactive approach has its own merits. A comparison, however, between MOLP and the sensitivity analysis of the weights in GP would provide a further step in making these models more user-friendly. Chapter 4 examines the impact of the degeneracy problem on pricing and valuation of corporate assets, using degenerate bases vs. incremental or decremental shadow price sets. The examples are solved using LP and MOLP models. Chapter 5 expands the discussion of these models to the analysis of transfer pricing, allocation of overhead and joint costs of production, variance analysis, and performance measurement.

The application of network flow models to foreign exchange and arbitrage problems are discussed in Chapter 6. Formulating the problem using such models allows the decision-maker to develop successful currency trading strategies by evaluating the different solutions and quickly responding to rapid fluctuations in exchange rates.

The next two chapters focus on other topics pertinent to financial planning in large national and multinational corporations. The emphasis is on providing a general, conceptual framework rather than strictly adhering to the current legal or accounting requirements of a particular country. Chapter 7 is devoted to the formulations of different models for the acquisition and maintenance of control and/or ownership of a group by a parent company. The optimal group structure affects capital investment decisions for the group and their financing requirements. The effects of such transactions on consolidated financial statements also are analyzed. Chapter 8 explains how the group structure of a multinational company is affected by international taxation. Linear and dynamic programming are used to determine the optimal structure for tax planning. Several examples are solved for different hypothetical tax regulations.

The availability of user-friendly software will enhance the applications of these models in practice and will enrich classroom discussion by expanding these models to deal with risk analysis and probabilistic estimation.

This text is a welcome addition to advanced management accounting literature. The level of presentation is suitable for a graduate course, and it can be adopted as a separate text or as a supplement to another text.

Mohamed Onsi
Professor of Accounting
Syracuse University

T. A. Lee, *Towards a Theory and Practice of Cash Flow Accounting*, Accounting Thought and Practice Through the Years Series (New York and London: Garland Publishing, Inc., 1986, pp. 285, $30.00).

This book is a collection of writings by the British academician T. A. Lee regarding the usefulness of a cash flow based financial reporting system. The approach used in the writings to address issues in cash flow reporting has similarities to work by Edwards and Bell (1961), Chambers (1966), and others who attempted to define an optimal reporting system based on a definition of "true economic income" or basic user needs. This book differs from the earlier *a priori* literature in that it is a compendium of articles written between 1972 and 1985 on various aspects of the accrual/cash flow controversy instead of being a fully integrated treatise on the topic.

Such a structure has both costs and benefits to the reader. As one reads through the many papers, the development and adjustment of Professor Lee's thoughts on the cash flow reporting issues can be surmised. On the other hand, it is sometimes hard to understand why several of the papers are selected for inclusion. In some cases, the articles seem to restate the same basic issues, with little alteration. The book includes little by way of integrating discussion between readings. The introduction provides some overview, but leaves most of the responsibility to integrate the writings to the reader.

The issue of cash flow reporting is a very slippery one. In fact, the very term "cash flow reporting" means something different to each of us. In the U.S., we tend to think of cash flow reporting as referring to the requirement to provide a "funds statement" on a cash basis. The writings of Heath (1978) come to mind as a recent academic effort to address issues of reporting for solvency and cash flow. While this supplemental reporting approach is certainly important, Lee's concern is not in designing a cash flow report in the midst of an accrual accounting system. Rather, his arguments relate to the wholesale replacement of the accrual based system with a cash flow system.

The articles contained in the book tend to be of three types. First, there are a number of papers directed at justifying cash flow reporting as an appropriate system for providing relevant information to general users of financial statements. Second, there are a series of works devoted to the detailed development of a cash flow reporting scheme, right down to the structure of the financial reports. Lastly, there are several empirical papers, which might be described as case study applications of the cash flow reporting scheme developed in the other work.

The papers in the first category read very much like others in the early history of accounting thought, for example, Paton and Paton and Littleton. These papers can be characterized as arguing that cash flow data is the best information that a financial statement user can receive. It is tempting to simply point out that there is no general theory of what information users need in making all sorts of economic decisions, and that Lee's arguments regarding usefulness *may* have no basis in fact. However, Lee appears to recognize this problem himself, and a more careful reading exposes a deeper insight. Lee appears to be arguing that it is possible that a system of cash flow reporting is more useful, and that it should be tried. His arguments are more in the vein of explanations for why cash flow reporting might be more useful. Of course, there is always the lingering question regarding why the accrual system has become so popular if cash flows are so much better. The papers included in this anthology do not give much insight into this issue except to suggest that it may be a result of evolutionary history.

Most of this book is focused on the specific development of formal statements under the cash flow approach and case applications where the information on cash flows appears to shed a different light on the financial position of the company involved. The development of an entire system of reporting using the cash flow approach is useful in many ways. It stimulates the reader to think about the smallest of details in the preparation and communication of financial data. Such detailed analysis on such a broad topic is at times a challenge. In addition, such a detailed explication provides a complete basis of comparison to the accrual based system which is not available as a contrast in the system proposed in the U.S. (e.g., provision of a cash flow statement as a supplement to the accrual based statements).

The book would be particularly useful in course work which is designed to address what we have traditionally labelled accounting theory. It raises many questions regarding usefulness and user needs which standard setting agencies in the United States have wrestled with for many years. The book is also good background reading for those of us interested in the information value of cash flow data. There are no new issues presented, but it is useful to have the discussion so well laid out and integrated

The book does have weaknesses. The presentation of a series of published articles instead of an integrated presentation like Heath's makes the material more difficult to digest than it needs to be. In addition, many of the same theses run through several of the papers selected. At times the repetition of ideas is tiresome and this results in missing the nuances each article has to present. Overall, the book will have a place in the accounting literature, but only for those who have a particular deep interest in cash flow reporting or are teaching in the area where *a priori* accounting theory is a focus of attention.

LANE A. DALEY
Associate Professor of Accounting
University of Minnesota

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KENNETH A. MERCHANT, *Fraudulent and Questionable Financial Reporting: A Corporate Perspective* (Morristown, NJ: Financial Executives Research Foundation, 1987, pp. iv, 48, $10.00 paper).

This research report on fraudulent and deceptive financial reporting practices is based on a study of complaints and court records of a number of recent frauds and discussions with individuals who have knowledge about how fraudulent and deceptive financial reporting takes place and is detected. In conducting the research, interviews were conducted with over 100 general managers, controllers, and internal auditors in six firms that had not been involved in recent situations involving fraudulent reporting. Based on the interviews, two fictional but realistic case studies were developed and discussed by two expert panels assembled by the Financial Executive Institute. This book represents a distillation of knowledge gained through the various research methods including the court records, interviews, and panel discussions.

The book includes five short chapters and the two cases discussed by the panels. The first chapter introduces the problem of fraudulent financial reporting and cites four examples. The second chapter describes the range of deceptive financial-reporting practices, from those clearly fraudulent to those merely questionable. The significant societal, organizational, and personal costs resulting from deceptive reporting are also discussed. Chapter 3 provides an overview of the organizational and individual cases of deceptive financial reporting practices. Included are discussions of incentives and other inducements provided by corporations, temptations for employees caused by control weaknesses, environmental change, high divisional autonomy, weak internal audit, ineffective board of directors, and insignificant or secret penalties; lack of moral guidance and leadership; and individual circumstances. Chapter 4 describes a number of partial solutions to the problem of fraudulent and questionable reporting practices. Each of the nine solutions discussed is tied to the basic causes of deceptive practices. Chapter 5 is a short summary that classifies financial reporting practices on a continuum of acceptability.

The monograph is useful for readers who want to review or be introduced to the issues surrounding deceptive financial reporting. In addition, the Graves Industries, Inc. and DISTECH, Inc. cases would work well to illustrate and discuss deceptive financial reporting in the classroom. Readers who expect results based on sound methodology will be disappointed. Because the monograph relies so heavily on interviews and personal opinions, it can only be viewed as a descriptive work. Even then, some of the discussions, especially Chapter 2 on types of deceptive reporting, Chapter 3 on causes, and Chapter 4 on solutions, were rather superficial. There are many types of deceptive reporting and causal factors that are not even mentioned. If used as an introduction to questionable reporting practices, however, the monograph should be useful to accounting educators and their students.

W. STEVE ALBRECHT
Professor of Accounting
Brigham Young University

MARK STEVENS, *The Accounting Wars* (New York: Macmillan Publishing Company, 1985, pp. x, 261, $7.95).

Chapter 1 sets the environmental stage for the book by describing the shift of American business from a manufacturing to a service- and technology-oriented economy. With audit services becoming a commodity, CPA firms are being pressured from within and lured from without to offer a wider array of non-audit services. This "commercialization" of services raises questions about the professionalism of CPA firms and their ability to maintain the actual and perceived independence that is essential for traditional audit services.

The need for American CPA firms to expand internationally, both to participate in growing foreign markets and to service the global markets of domestic clients, is explored in Chapter 2. Three alternative strategies for expansion are examined: internal growth, merger with an existing foreign firm, and affiliate arrangements with foreign firms. The author uses Main Hurdman as a case study to demonstrate that merging with existing foreign firms, rather than internal growth, is the only feasible strategy for a second tier Big Eight firm, given the international presence and competitive power of Big Eight firms.

Chapter 3 studies the avenues taken by Price Waterhouse and Deloitte Haskins and Sells to establish practices in China. The strategy for international expansion in this case requires firms to perform gratis services for governmental agencies in order to establish a preferred position in the country. The author raises conflict-of-interest questions when the recommendations made to these governmental agencies, such as for taxation systems, significantly impact major clients of the CPA firms doing business in China.

In addition to expanding internationally, CPA firms are also expanding their scope of services. Chapter 4 explores efforts to nestle more closely with Wall Street by offering an array of financial consulting services. The CPA firms are expanding "their practice webs not only to trap the fast track service and high-tech industries, but also to profit from the decline of the smokestacks. By helping to structure the former and disassemble the latter, they profit from success and failure" (pp. 114-115). The author questions the impact of transactions-based fees versus the more traditional hourly-based fees on the professional versus profit motives and attitudes of CPA firms.

Chapter 5 studies the extension of CPA services to tax-shelter activity. The author suggests that "CPA firms are embracing tax shelter engagements because they appear, at first blush, to be the best of both worlds: basically an audit function under the guise of consultative services. . . . The unwanted by-product, however, is that tax shelter work prompts CPA firms to lend their names to transactions for which they can make no definitive statements, and to give investors a false sense of security" (pp. 175-176). The author uses a clever interchange between a tax-shelter investor and personnel from the CPA firm involved with the tax-shelter prospectus to illustrate the misconceptions concerning the role and responsibility of the CPA firm.

Chapter 6 presents an interesting study of the life cycle of a CPA firm. With auditing a commodity and Big Eight firms reaping substantial economies of scale, small and medium size CPA firms must grow by emphasizing business advisory services. The CPA must be viewed as an entrepreneur, offering advice on marketing, manufacturing, financing, and other strategies. These higher margin services will permit smaller firms to establish niches that can be protected from the competitive power of the Big Eight.

The theme of Chapter 7 is set out in its initial sentence. "Not all the competition in accounting is over who does what best. Increasingly, clients are won and lost on the basis of a less noble criterion: Who is most willing to sacrifice professional standards for audit fees" (p. 219). This chapter provides several illustrations of "opinion shopping" and the impact of such activities on the profession.

This book is quite readable and focuses on many important issues facing the accounting profession. Accounting students should find it entertaining and perhaps even enlightening. I felt that the author reacted naively and in a sensationalistic way to anecdotal examples in many cases (tax shelter work, cooking the books, conflict of services), resulting in a book that should sell better in grocery stores than in a college book store. Although, billed as a study of the second tier Big Eight to complement the author's earlier study of the first tier Big Eight, the book is actually a collection of leftover topics, with as much or more space devoted to Big Eight firms as second Big Eight. One gets the same let down feeling as when watching the follow-up versions of many popular movies.

Clyde P. Stickney
Signal Companies
Professor of Management
Dartmouth College

Rodney D. Stewart and Richard M. Wyskida, A Wiley-Interscience Publication, *Cost Estimator's Reference Manual* (New York; Chichester, England; Brisbane; Toronto; and Singapore: John Wiley & Sons, 1987, pp. xxiii, 620, $59.95).

The book promises "to permit a thorough cover to cover study of Cost Estimating" and a "quick reference" to specific areas. In particular, the book claims to present the process of cost estimation, describe the available tools and techniques, provide appropriate references, and identify whom to contact for further information.

These objectives are too broad and diverse to be satisfied by one book. Having set out those objectives, however, the book does a good job of fulfilling them. It concentrates on project cost estimation and deals with both detailed engineering cost estimation and parametric (analytical) cost estimation processes; presents an overview of cost accounting techniques, statistical techniques, discounted cash flow analysis, and learning curve theory as the primary tools required for cost estimation; and provides an exposition of specialized cost estimation methods for construction, manufacturing, and software development. Some special topics such as the use of microcomputers and artificial intelligence, the professional aspects of cost estimation, and cost estimation for government also are discussed.

Several points are of general concern. There is inadequate emphasis on, and in some cases no mention of, the assumptions on which the theories are based. For example, econometric theory is presented under assumptions of no autocorrelation and no heteroscedasticity. A number of statistical models assume an underlying normal distribution. A discussion in the book of the statistical tests for the validity of these assumptions, the procedures to deal with violations of the assumptions, and the robustness of some of the results when the assumptions are not met would have been very helpful.

More realistic examples also would have enhanced the value of the book. The examples presented are very diverse and it often would have helped to have one example presented and carried through one or more chapters.

A more natural way to present the materials in the book would have been to divide it into different modules. Chapters 1, 6, 7, and 8 deal with the general cost estimation process. Chapters 10, 11, and 12 deal with cost estimation in specialized industries. Chapters 2, 3, 4, and 5 deal with the requisite background material. Chapters 9 and 15 deal with methodological issues and Chapters 13 and 14 with special issues. Presenting them as different modules and sequencing them differently would have improved readability.

In addition, there is a wide variation among chapters in the level of detail and the provision of reference lists. For example, Chapter 2 attempts to cover the entire field of cost accounting and, in the process, depth of presentation is lost. Important concepts like incremental costs and opportunity costs are not introduced. No references are provided for these and other cost accounting concepts. Other chapters do provide good lists of references for the interested reader and Chapter 9 presents materials at a more detailed level than other chapters.

A few quibbles. When the test statistic does not fall in the rejection region, it is contended on page 117 that null hypothesis is accepted. It would be preferred to state that the sample did not provide enough evidence to reject the null. On page 245, a linear equation is presented instead of the power equation derived. Also, some figures such as 5.3 are not very clear.

In summary, this book is a good reference book but needs to be supplemented by other texts if a comprehensive treatment is desired.

Bin Srinidhi
Assistant Professor of Accounting
New York University

NEW BOOKS: AN ANNOTATED LISTING

Editor's Note: As a general policy, books received but not reviewed in this or future issues will be annotated. There will be some exceptions.

KENNETH J. ARROW and HERVE RAYNAUD, *Social Choice and Multicriterion Decision-Making* (Cambridge, Massachusetts and London: The MIT Press, 1986, pp. vii, 127, $15.00).

Study examines in eight chapters the industrial outranking problem: the ranking of a large number of alternatives from best to worst according to a weak ordering which represents a synthesis of a large number of criteria. Authors propose a means of multicriterion analysis which goes beyond formulation of an empirical recipe. Part One considers psychological considerations and results which aid in modelling an ordering process which permits conflicting and incommensurable criteria. Part Two examines the majority method and demonstrates the limited capacity of the rule for solving the problems of the industrial decision-maker. Part Three explores the axiomatic system and practical techniques which arise from it. Kenneth J. Arrow is Professor of Economics at Stanford University and was awarded the Nobel Prize in Economics in 1972. Herve Raynaud is affiliated with the Tour Mathematiques of IMAG in France.

EUGENE F. FINKIN, *Successful Corporate Turnarounds* (New York; Westport, CT; and London: Quorum Books, a Division of Greenwood Press, Inc., 1987, pp. xviii, 211, $35.00).

Author examines the approaches and actions necessary for successful turnaround of a failing company. Sixteen chapters discuss the three stages of a successful turnaround; an example of a corporate turnaround; the importance of internal and external communication; turnaround issues by functional area, including finance, marketing, and product development; operation during strikes and a summary. Eugene F. Finkin has been an officer of Blaw Knox Corporation and Danly Machine Corporation.

BRUCE R. HOPKINS, *The Law of Tax-Exempt Organizations*, Fifth Edition (New York; Chichester, England; Brisbane; Toronto; and Singapore: John Wiley & Sons, 1987, pp. xii, 949, $85.00).

Forty-four chapters present a general introduction to the law of tax-exempt organizations. Seven parts cover an introduction to tax-exempt organizations, charitable organizations, other types of tax-exempt organizations (i.e., business leagues and social clubs), private foundations, qualification of exempt organizations, feeder organizations and unrelated income taxation, and inter-organizational structures and operational forms. Appendices include Internal Revenue Code Sections, a table of cases, tables of IRS rulings, procedures, and other items, as well as a list of IRS key district offices. Bruce R. Hopkins is Professor at the George Washington University National Law Center.

PHILIP KROPATKIN, *Management and the Audit Network*, The Wiley-Institute of Internal Auditors Professional Book Series (New York; Chichester, England; Brisbane; Toronto; and Singapore: John Wiley & Sons, Inc., 1987, pp. xii, 188, $35.00).

Book depicts the corporation as a network and focuses on the functions of the internal/external auditor and accountant. Four parts discuss the nature and components of the corporate and audit networks, rules of thumb for the CEO concerning audit effectiveness and concluding remarks on coordinating staff and operational divisions. Included among four appendices is a "how to" for writing an audit finding. Volume is written for managers, auditors, and accountants. Philip Kropatkin is the former Assistant Inspector General for Auditing at the Department of Health and Human Services.

GRANT W. NEWTON and GILBERT D. BLOOM, *Tax Planning for the Troubled Business 1987* (New York; Chichester, England; Brisbane; Toronto; and Singapore: John Wiley & Sons, 1987, pp. xiii, 425, $49.95).

Current revision of annual guide on tax aspects of decisions to be make by financially troubled companies. Eight chapters discuss provisions of the Internal Revenue Code and the Bankruptcy Code applicable to firms which have filed Chapter 7 or 11 bankruptcy petitions. Among topics considered are: taxation of individuals, partners and corporations filing a Chapter 7 or 11 petition; the tax impact of debt forgiveness on creditors; discharge of indebtedness and its tax impact with regard to the debtor; tax free corporate reorganizations; and tax procedures, discharge, and priorities. Appendices include the Senate Report No. 96-1035 on H.R. 5043 (Bankruptcy Tax Act of 1980) and Senate Proposed Amendments to this bill; Representative Ullman's statement regarding this bill; the Bankruptcy Tax Act of 1980; and selected provisions of the 1984 and 1986 Tax Reform Acts, both of which amend the Bankruptcy Tax Act of 1980. Grant W. Newton is at Pepperdine University and Gilbert D. Bloom is with Peat Marwick in Washington, D.C.

ARUN J. PRAKASH, GORDON V. KARELS, and Ray Fernandez, *Financial, Commercial, and Mortgage Mathematics and Their Applications* (New York; Westport, CT; and London: Praeger Publishers, a Division of Greenwood Press, Inc., 1987, pp. x, 245, $42.95).

Five chapters begin with an exposition of the mathematical foundations of interest rate calculations: exponents sums of geometric series, Taylor's Theorem and e. Basic aspects of "time value of money" are then discussed. In the final three chapters the theory of interest is applied to a variety of specific problems and issues in mortgage mathematics, commercial mathematics, and capital budgeting. Practical and theoretical problems and their solutions and chapter references are provided. Professor Prakash is Associate Professor at Florida International University; Gordon V. Karels is Assistant Professor at the University of Nebraska; and Ray Fernandez is Chairman of the Business Department at Miami Dade Community College.

DANA M. RONALD, *Successfully Developing Your Accounting Practice: A Practical Guide with Forms, Letters, and Checklists* (New York; Chichester, England; Brisbane; Toronto; and Singapore, 1987, pp. x, 314, $39.95).

Three part guide for the accounting practitioner. Part one deals with how to market, and discusses marketing psychodynamics, referrals, cross-selling, direct mail, telemarketing, advertising, seminars, and newsletters. Part two has five chapters on selling skills. Part three concerns the market plan, and examines topics like ethics, service mix, site selection, and implementing a market plan. Dana M. Ronald is President of Pacific Business Management Services, Inc.

RICHARD M. STEINBERG and HAROLD DANKNER, *Pensions*, Third Edition (New York; Chichester, England; Brisbane; Toronto; and Singapore: John Wiley & Sons, 1987, pp. x, 352, $59.95).

Third edition of volume first published in 1975 and revised in 1983. Three parts cover pension fundamentals and provisions of ERISA; employer company accounting, auditing, and financial reporting; and pension plan accounting, auditing and financial reporting. Four appendixes contain information about ERISA minimum participation standards, vesting standards, minimum regulations relating to hours of service, and qualified joint and survivor annuities. Two other appendixes deal with disclosures to plan participants and beneficiaries and an illustrative letter requesting a copy of the actuary's report and other information on the plan. The authors are partners in Coopers & Lybrand.

LESTER C. THUROW, Editor, *The Management Challenge: Japanese Views* (Cambridge, MA; and London: The MIT Press, 1985, pp. xi, 237, $7.95 paper).

Collection of eleven essays by Japanese academics and managers on various aspects of business in Japan and the Japanese economy. Topics include motivation and productivity, the impact of culture on management, the perceptions and reality of industrial relations, the firm and the market, the financial system, product diversification, overseas market strategy, competition and cooperation among Japanese corporations, industrial policy, economic planning, and the economy. Editor has written an introduction and short analysis at the end of each chapter about the implications raised for "reblending the American economic mixture." Lester C. Thurow is Gordon Y. Billard Professor of Economics and Management and Dean of the Sloan School of Management at the Massachusetts Institute of Technology.

Worldscope Industrial Company Profiles Bridgeport, CT: Wright Investors' Service, 1987, Volumes I-V, unpaginated, $1,100 subscription).

Five volumes present corporate financial data on over 3,000 industrial companies in 18 industries of 24 countries, including the U.S. Volume I contains a user guide, country and industry averages for date from profiled companies; company rankings worldwide, within each country and within each industry based on net sales for fiscal year 1985; and company indexes, alphabetical by country and by industry. Volumes II through V present profiles on companies within major geographic regions: Asia, Africa, and Australia; Europe; and two volumes for North America. Profiles include general information, financial statement data, financial ratios, stock market performance ratios, five-year annual growth rates, and company specific accounting practices. Two appendices for each region give capitalization changes by company within country and companies with multiple equity issues. Reference is the product of two financial research companies, Wright Investors' Service and the Center for International Financial Analysis and Research, Inc.

Editor's Note: Catherine McNally assisted the editor in annotating these books.

BOOKS RECEIVED MAY 15, 1987 TO JULY 23, 1987

AMERICAN TAXATION ASSOCIATION, *Tax Planning for Educators 1987* (Sarasota: American Accounting Association, 1987, pp. 90, $6.00-members, $8.00-nonmembers).

KENNETH J. ARROW and HERVE RAYNAUD, *Social Choice and Multicriterion Decision-Making* (Cambridge, MA and London: The MIT Press, 1986, pp. vii, 127, $15.00).

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Philip Kropatkin, *Management and the Audit Network*, The Wiley-Institute of Internal Auditors Professional Book Series (New York; Chichester, England; Brisbane; Toronto; and Singapore: John Wiley & Sons, Inc., 1987, pp. xii, 188, $35.00).

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Arun J. Prakash, Gordon V. Karels, and Ray Fernandez, *Financial, Commercial, and Mortgage Mathematics and Their Applications* (New York; Westport, CT; and London: Praeger Publishers, a Division of Greenwood Press, Inc., 1987, pp. x, 245, $42.95).

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H. *I certify that the statements made above are correct and complete.*

Paul L. Gerhardt, Executive Director

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AMERICAN ACCOUNTING ASSOCIATION

Announcement of

Fellowship Program in Accounting

For Academic Year 1988-89

PURPOSE

The purpose of the Fellowship Program is to increase the supply of qualified teachers of accounting in the United States and Canada. Fellowships will be awarded to assist individuals in furthering their preparation, through doctoral studies, for teaching in colleges and universities.

ELIGIBILITY

1. Expressed interest in and outstanding promise for a career in teaching accounting.
2. Acceptance in a doctoral program at a school accredited by the AACSB at the master's level.
3. Submission of a complete set of application forms.
4. Only candidates entering the doctoral program are eligible. Actual awards will go only to students in the first year of their doctoral program.
5. Foreign students are eligible for fellowships if a resident of the U.S. or Canada at the time of application and are enrolled in or have a degree from a U.S. or Canadian accredited graduate program; and plan to teach in the U.S. or Canada.
6. All awards will be in the amount of $5,000 to be made to outstanding applicants based only on academic merits.

APPLICATION

1. The application must be complete in all respects; i.e., the required number of forms requested, recommendation letters, and graduate admissions test scores.
2. The deadline for receipt of all application materials is February 1, 1988.
3. Requests for application forms should be addressed to:

Mr. Paul L. Gerhardt, Executive Director
American Accounting Association
5717 Bessie Drive
Sarasota, Florida 34233

FIELD OF STUDY

The doctoral program is expected to be in accounting or in another area suited to preparing the applicant for teaching accounting.

DURATION

Fellowships will be granted for one academic year.

PAYMENT

Payment of the academic year Fellowships will be made to the recipients at the beginning of the first semester or quarter. The recipient must submit evidence of on-campus enrollment.

ANNOUNCEMENT OF AWARD

Awards will be announced on or about April 1, 1988.

ADMINISTRATION

The program is administered by a committee composed of members of the American Accounting Association.

JANUARY 1988 PLACEMENT ADS

The deadline for information to be included in the "Placement Information" section is two months prior to the date of publication. The REVIEW *is published on the first day of January, April, July, and October. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233. All replies to box numbers should be on separate sheets to facilitate forwarding. There is no charge for this service to AAA members and associate members seeking employment. Others will be charged a fee of $100 per insertion. Ads should not exceed 100 words.*

#101 GONZAGA UNIVERSITY, Spokane, Washington, seeks applicants for two tenure-track accounting faculty positions—financial/public accounting and tax. Candidates should hold a doctorate in accounting or ABD nearing completion. Professional certification and related work experiences are pluses. The School of Business Administration desires well-balanced performance by its faculty, including teaching excellence, publications, and service. Gonzaga is a Jesuit university with an enrollment of 3,700. School of Business enrollment is approximately 600 undergraduate and 100 MBA students. Spokane is an all-American city of 300,000 within an hour's drive of 70 lakes, three ski resorts, and several national parks. Apply to: Dr. Lawrence Lewis, Chairman, Department of Accounting, School of Business Administration, Gonzaga University, Spokane, WA 99258. Gonzaga is an Equal Opportunity Employer.

#102 UNIVERSITY OF MARYLAND (COLLEGE PARK) invites applications for Assistant or Associate Professor of Accounting. The minimum qualification for Assistant Professor is a Ph.D. degree. A candidate for Associate Professor should have a distinguished publication record and a record of quality teaching. The University of Maryland is an equal opportunity/affirmative action employer. Women and minorities are encouraged to apply. Interested candidates should send resumés to Professor Martin Loeb, College of Business and Management, University of Maryland, College Park, MD 20742.

#103 CALIFORNIA STATE UNIVERSITY, NORTHRIDGE, has full/time faculty openings at the ranks of Professor and Lecturer for the academic year 1988-89. The Department offers BS and MS degree options in Accounting Theory and Practice and MIS. Doctorate in Accounting required for tenure and promotion. CPA and CMA certificate desired. Salary level $23,400-$53,000, commensurate with qualifications. Opportunity to increment salary teaching Summer School. We are an equal opportunity/affirmative action, Title IX, Section 504 employer. Address inquiries to: Arthur C. Nieminsky, Department Chairman, Department of Accounting and MIS, School of Business, CSUN, Northridge, CA 91330. Application deadline: February 15, 1988, or until positions are filled.

#104 LECTURER, ASSISTANT OR ASSOCIATE PROFESSOR; auditing is our primary need, but others will be considered. Assistant and Associate positions require a doctorate in accounting from an AACSB accredited school; Associate requires a record of teaching excellence and a record of recent and continuing research published in national refereed journals. ABD within one year of completion will be considered. Masters/CPA can be appointed to non-tenure track lecturer positions. Send resumé to: Chair, Department of Accounting, College of Business and Economics, University of Nevada, Las Vegas; Las Vegas, Nevada 89154. Review of applications will begin on September 1, 1987. EO/AA employer.

#105 CHAIRPERSON, Department of Accounting, University of Nevada, Las Vegas. There are 14 faculty, 600 undergraduate majors; MS and MBA Programs. Applicants must have an earned doctorate in accounting from an AACSB accredited school and a record of recent and continuing research appearing in national publications. Send resumé, letter of application and three letters of reference to: Dr. W. T. Cummings, College of Business and Economics, University of Nevada, Las Vegas, Las Vegas, Nevada 89154. Review of applications will begin on September 1, 1987 and continue until the position is filled. EO/AA employer.

#106 CALIFORNIA STATE UNIVERSITY, STANISLAUS seeks faculty in Accounting. Rank and salary open, depending on qualifications. Undergraduate and graduate programs. Teaching excellence is stressed; scholarship and professional activity encouraged. Require relevant doctorate earned or very close to completion. Prefer proven record of teaching excellence. CPA preferred. Modern facilities, rural setting, low-cost housing. 4-1-4 calendar eliminates disadvantages of traditional semester and quarter systems. Two-hour drive to San Francisco or High Sierra. Cal State University-Stanislaus is an Affirmative Action/Equal Opportunity employer. Applications and inquiries should be directed to: Dr. Gerald E. Nichols, Chairman; Department of Accounting & Finance, School of Business Administration, California State University, Stanislaus, Turlock, CA 95380. Telephone (209) 667-3671.

#107 CALIFORNIA STATE UNIVERSITY, LOS ANGELES is accepting applications from candidates for Assistant, Associate, and Full Professor positions for 1988-89. Tenure-track and one-year appointments are available. Tenure-track positions normally require a doctorate or ABD, except in taxation which requires a J.D. or MBT. Candidates should be able to demonstrate teaching effectiveness and research capabilities. The Department's strongest needs are for persons who can teach financial accounting (under-graduate and graduate). California State University, Los Angeles is an Equal Opportunity/Affirmative Action Employer. Interested candidates are invited to submit their curriculum vitae to Gary V. Jorden, Chair, Department of Accounting, California State University, Los Angeles, CA 90032.

#108 STEPHEN F. AUSTIN STATE UNIVERSITY anticipates tenure-track positions for the Fall 1988 semester. Preferred level of appointment is at the assistant level, but appointments will be considered at any rank dependent upon qualifications. Earned doctorate is preferred, advanced ABDs will be considered. Professional certification is desirable. SFASU is a 12,500 student body, state-supported university located in Nacogdoches, Texas, 130 miles north of Houston and 160 miles southeast of Dallas. The School of Business Administration is AACSB-accredited with more than 4,000 majors. The Department of Accounting has approximately 700 majors with 15 full-time faculty. Interested candidates are invited to submit their resumé to Professor Sammie L. Smith, Chairman, Department of Accounting, Stephen F. Austin State University, Nacogdoches, TX 75962. SFASU is an EO/AA employer.

#109 THE UNIVERSITY OF MIAMI is seeking an experienced Assistant or Associate Professor with a background in Cost/Managerial Accounting. Applicants should provide evidence of strong teaching and research skills. Research credentials should demonstrate a scholarly and programmatic personal research program that has led to publications in leading academic journals. Duties include continued research productivity as well as participating in graduate program development and instruction. A doctorate is required. Send resumé and references to Professor Lawrence C. Phillips, Department of Accounting, School of Business Administration, P.O. Box 284031, Coral Gables, Florida 33124. We are an Affirmative Action/Equal Opportunity Employer.

#110 THE DIVISION OF ADMINISTRATION-UNIVERSITY OF NEW BRUNSWICK, Saint John, New Brunswick, Canada, invites applications for a full-time tenure-track position in Financial Accounting commencing July 1, 1988. Rank and salary commensurate with qualifications and experience. Ph.D. or equivalent required—candidate with a strong background in Information Systems preferred but candidates with lesser qualifications may be considered for a term appointment. Send c.v. and names of three referees to Dr. Peter McGahan, Dean of Faculty, University of New Brunswick, Box 5050, Saint John, New Brunswick, Canada E2L 4L5. In accordance with Canadian Immigration Regulations, preference will be given to citizens and permanent residents of Canada.

#111 MISSISSIPPI STATE UNIVERSITY, School of Accountancy solicits applicants for teaching positions in January and/or August 1988. Applicants should have earned the doctorate and demonstrated success in research leading to publications in professional journals. Professional certification is desired. Applications should be mailed to: Director, School of Accountancy, Mississippi State University, P.O. Drawer EF, Mississippi State, MS 39762. An equal opportunity affirmative action employer.

#112 CAL POLY STATE UNIV.-SAN LUIS OBISPO seeks candidates for Accounting Department Head for appointment September 1988. Candidates must have doctorate and record of excellence in teaching, research, and service to support appointment at rank of teaching, research, and service to support appointment at rank of full professor. Administrative experience and certification preferred. The School is AACSB accredited at undergraduate and graduate levels. Send resumé to Dean Kenneth Walters, School of Business, Cal Poly State Univ., San Luis Obispo, CA 93407. Closing date: February 15, 1988 or until filled. Cal Poly is an equal opportunity/affirmative action employer and only hires individuals lawfully authorized to work in the U.S.

#113 CALIFORNIA POLYTECHNIC STATE UNIVERSITY-SAN LUIS OBISPO seeks candidates for September 1988 appointments in tenure-track faculty positions. Primary need is managerial/cost area; others considered. Doctorate required. Professional certification preferred. Candidates must be committed to teaching excellence and professional development including research and publication. Rank and Salary commensurate with experience. Contact Dr. William Boynton, Accounting Department, School of Business, Cal Poly State Univ., San Luis Obispo, CA 93407. Closing date—February 15, 1988 or until filled. Cal Poly is an equal opportunity/affirmative action employer and only hires individuals lawfully authorized to work in the U.S.

#114 CONCORDIA UNIVERSITY-MONTREAL, CANADA Department of Accountancy of the Faculty of Commerce and Administration is inviting applications for tenure-track positions in financial accounting, auditing, management accounting, and information systems for January or June of 1988. Rank and Salary are open and commensurate with the qualifications and experience. Visiting appointments are also available. Professional designation is a plus. Research is strongly encouraged and supported. The Department of Accountancy with 30 tenure-track positions is one of the largest in Canada and the North America. In accordance with the Canadian immigration requirements, priority will be given to qualified Canadian citizens and permanent residents. Please send resumé in confidence to: Dr. Farhad Simyar, Professor and Chair, Department of Accountancy, Faculty of Commerce and Administration, Concordia University, 1455 de Maisonneuve Blvd. West, Montreal, Quebec H3G 1M8, CANADA.

#115 CLARKSON UNIVERSITY, projects an opening for a tenure-track position in auditing and financial accounting beginning August 1988. Candidates must have a doctorate or be actively completing a dissertation. Effective teaching and research leading to publication are required for promotion. Clarkson is a medium-size school with high-quality students and a productive/friendly faculty located in the St. Lawrence River valley just north of the Adirondack Mountains less than two hours from Ottawa and Montreal. Contact Wayne J. Morse, Chairman, Faculty of Accounting, Clarkson University, Potsdam, NY 13676. Clarkson is an equal opportunity affirmative action employer.

#116 SUFFOLK UNIVERSITY, Boston, MA. The Accounting Department anticipates FT tenure track position openings for 9/1/88 at UG/G levels in managerial and/or financial areas with secondary interests in accounting information systems or auditing. PhD/DBA in Accounting and evidence of effective teaching, research and a strong publication record required. CPA, CMA, or other certification(s) desirable. Apply to Ronald Sundberg, Associate Dean, School of Management, Beacon Hill, Boston, MA 02108 or call (617) 573-8301. An equal opportunity, affirmative action employer.

#117 THE UNIVERSITY OF CALGARY Faculty of Management invites applications for tenure-track positions commencing Winter 1988 or Fall 1988. Positions are available in auditing, financial, and managerial accounting. Candidates should have a Ph.D., or DBA with a major in accounting. ABD's in advanced dissertation stage will be considered. Normal teaching load is six-hours per term. Computer assistance and research support are available. In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. Applications should be addressed to Dr. J. R. Brent Ritchie, Associate Dean (Research and Development), Faculty of Management, The University of Calgary, 2500 University Drive N.W., Calgary, Alberta T2N 1N4.

#118 THE UNIVERSITY OF CALGARY invites applications for Chartered Accountants' Professorship in Accounting. This position, created by The University of Calgary with support received from the Accounting Education Foundation of Alberta, is intended to attract an outstanding individual to provide leadership in enhancing the quality of accounting education in the Faculty of Management. In addition to the demonstrated record of scholarly achievement expected for appointment to the rank of Full Professor, the candidate must demonstrate a dedication to curriculum development in the field of accounting. In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. Applications should be addressed to Dr. J. R. Brent Ritchie, Associate Dean (Research and Development), Faculty of Management, The University of Calgary, 2500 University Drive N.W., Calgary, Alberta T2N 1N4.

#119 CENTRAL MICHIGAN UNIVERSITY has one or more faculty openings for the 1988–89 academic year. While all areas are encouraged to apply, the primary needs are in financial and managerial. Ph.D. or near completion is required, professional certification is desirable. Rank is open depending on qualifications. Competitive salary with excellent benefits. Maximum of nine-hour load per semester; summer teaching and research opportunities available. Excellent working and living environment. Undergraduate business programs are AACSB accredited. Contact: Philip L. Kintzele, Chairman, Department of Accounting, Central Michigan University, Mt. Pleasant, MI 48859. CMU is an AA/EO institution; all parties are invited to apply.

#120 GEORGIA INSTITUTE OF TECHNOLOGY, COLLEGE OF MANAGEMENT. Applications are invited for tenure track faculty positions, beginning in September, 1988, at the level of assistant professor in the area of Accounting. Candidates should have strong research prospects and be capable of effective teaching at the graduate and undergraduate levels. Applications should include a current vita, references, and copies of completed research papers or material relative to the dissertation. Send applications to Professor Arnold Schneider, College of Management, Georgia Institute of Technology, Atlanta, GA 30332. The Georgia Institute of Technology is an equal opportunity/affirmative action employer.

#121 SUNY-BINGHAMTON is seeking applications for appointments at the senior and junior level. Applicants for the senior level should present credentials for appointment at rank of full or associate. This individual will also direct the accounting program. PhD's and ABD's will be considered for the Asst. Prof. appointment. Highly selective and successful undergraduate program and established programs at the graduate level are growing through New York's new Graduate Study and Research Initiative. Send resumé to Dean T. F. Kelly, School of Management, SUNY-Binghamton, Binghamton, NY 13901. An equal opportunity/affirmative action employer.

#122 THE UNIVERSITY OF MINNESOTA'S DEPARTMENT OF ACCOUNTING invites applications for the position of Assistant Professor of Accounting (other ranks subject to qualifications and department needs). Applicants should possess a Ph.D. or should expect to obtain a Ph.D. before beginning employment. If A.B.D., instructor rank will be assigned until Ph.D. is completed. Responsibilities include conducting research, advising Ph.D. students, and teaching. A visiting position will be considered. Two applicant pools will be formed. Applications should be received prior to February 15, 1988 for permanent positions and prior to May 15, 1988 for visiting positions. The University of Minnesota is an equal opportunity educator and employer and specifically invites and encourages applications from women and minorities. David A. Dittman, Professor and Chairman, Department of Accounting, University of Minnesota, 271 19th Avenue South, Minneapolis, MN 55455. (612) 624-6506.

#123 UNIVERSITY OF SOUTH CAROLINA AT SPARTANBURG. Tenure track positions in financial accounting, subject to appropriation funding. Doctorate required. Teaching experience with CPA or CMPA; commitment to quality teaching. Publication record required appropriate to rank. Salary AACSB-competitive. USCS is near the Blue Ridge mountains yet convenient to Myrtle Beach. Spartanburg is in the industrial center of the state with over 100 foreign national firms and major textile manufacturing presence. USCS is an affirmative action, equal opportunity employer. Send vita to: Dean Jerry Bennett, School of Business Administration and Economics, University of South Carolina at Spartanburg, Spartanburg, SC 29303.

#124 ACCOUNTING FACULTY—The Division of Business Administration at PENN STATE-HARRISBURG invites applications for two tenure track faculty positions in Accountancy. Academic rank depends upon qualifications. Responsibilities include teaching upper-level and graduate courses, playing a leading role in the continued development of the accounting curriculum and pursuing scholarly research. Earned doctorate and strong publication record is required for senior positions. ABD's considered for junior positions. The Division of Business Administration enrolls approximately 550 students at the junior/senior undergraduate level and 275 in the MBA program. Please submit resumé to: Dr. H. C. Kuo, Chairman, Search Committee, c/o Robert Hamill, The Pennsylvania State University at Harrisburg, Box AAC, Middletown, PA 17057. Closing date is March 15, 1988 or until positions are filled. An Equal Opportunity/Affirmative Action Employer.

#125 THE UNIVERSITY OF MARYLAND European and Asian Divisions seek excellent teachers for undergraduate courses on U.S. military bases overseas. Minimum requirements include a master's in accounting, one year of recent college teaching experience, and U.S. citizenship. Renewable annual appointments begin August 1988. Excellent for a sabbatical or leave of absence. Benefits include transportation and military base privileges. Frequent travel and the cost of schooling make these positions difficult for those with children. Send resumé to Dr. Ralph E. Millis, The University of Maryland University College, College Park, MD 20742-1642, AA/EEO.

#126 ASSISTANT/ASSOCIATE PROFESSOR OF ACCOUNTING. Because of our continuing growth, one tenure-track position is available for Fall, 1988. The College is located in a pleasant residential neighborhood in the heart of the Minneapolis-St. Paul metro area. College of St. Thomas is a Catholic, coeducational, liberal arts college with 7,500 students including 1,900 undergrad business majors and 1,400 MBA students. Normal semester teaching load: three classes, two preparations. Ph.D., DBA or ABD desired; MBA plus professional certification required. Business experience required. We emphasize quality teaching, strong teacher-student relationships, and research and/or consulting. Consulting opportunities with small firms to large multinationals are excellent. The Twin Cities area offers well-known high quality of life. Contact Frank Coglitore, Box 6010, College of St. Thomas, 2115 Summit Avenue, St. Paul, MN 55105. Phone: (612) 647-5619. An Equal Opportunity Employer.

#127 THE UNIVERSITY OF TENNESSEE AT CHATTANOOGA invites applications for a tenure track position beginning August 1988. Rank is open, based on qualifications and experience. Candidates should have a Ph.D. or DBA in Accounting with an interest in the auditing and/or advanced accounting areas. The University places a balanced emphasis on teaching and research. The University has an enrollment of 8,000 students. The School of Business Administration has 1,600 undergraduate students and 250 MBA students. Applications should be sent to: Dr. John Fulmer, Head, Department of Accounting and Finance, University of Tennessee at Chattanooga, Chattanooga, Tennessee 37403. UTC is an equal opportunity/affirmative action employer.

#128 WASHBURN UNIVERSITY, Topeka, Kansas, has openings for tenure-track faculty positions at any rank starting in either January or August, 1988. Teaching areas include auditing, tax, managerial and systems. Responsibilities include quality teaching, research and service. Candidates must have Ph.D. or D.B.A. or be in the last stages of doctoral work (ABD). Certification desirable. Masters in taxation and J.D. may be considered for tax position. Send resumé to: Dean Joe Lavely, School of Business, Washburn University, Topeka, KS 66621, (913) 295-6307. Applications will be accepted until positions filled. Washburn University is an Equal Opportunity/Affirmative Action Employer.

#129 TENURE TRACK POSITIONS for the 1988-89 Academic Year. Rank and salary depend on academic preparation and experience. Ph.D. or ABD required for tenure track appointment. Our program includes a five-year Professional Accountancy Program in addition to baccalaureate curriculum. Send letter of application, vita, three (3) letters of reference and transcripts by February 12, 1988 to: Dr. Charles J. Pineno, Chair, Department of Accountancy, College of Business Administration, Clarion University of Pennsylvania, Clarion, PA 16214. EOE.

#130 COASTAL CAROLINA COLLEGE, a four-year campus of the University of South Carolina located near Myrtle Beach is seeking applicants for a tenure-track position in accounting starting Fall, 1988. An earned doctorate is required, although advanced ABD's will also be considered at the Assistant Professor level. Teaching interests should include at least one of the following: auditing, systems, or theory. Candidates will be evaluated based on teaching excellence, research, and service. Please send resumé to Dean Dale Molander, E. Craig Wall, Sr. School of Business Administration, USC-Coastal Carolina College, P.O. Box 1954, Conway, SC 29526. AA/EOE.

#131 INDIANA UNIVERSITY AT KOKOMO. Seeking tenure track faculty to do teaching and research in financial and managerial accounting beginning January, 1988, or August, 1988. Assistant/Associate Professor. Doctorate required (ABD's considered). Teaching responsibilities include nine hours of accounting at the undergraduate level per semester. Salary and rank commensurate with qualifications and experience. Excellent fringe benefits. The university is an equal opportunity, affirmative action employer. Send letter of application, vita, transcripts, and names and addresses of three references to: Dr. Raymond F. Bonhomme, Jr., Chair, Division of Business and Economics, Indiana University at Kokomo, 2300 S. Washington, Kokomo, IN 46902.

#132 THE UNIVERSITY OF MICHIGAN-FLINT has openings for tenure-track faculty positions at all ranks starting in either September or January. Most interest areas can be accommodated, although preference will be given to candidates in auditing and accounting information systems. Professional certification is desirable. Responsibilities include quality teaching, research, and service. Candidates must have a doctorate or be in the last stages of ABD. Salary is competitive and fringe benefits are excellent. Candidates should send a resumé to: Dr. Walter J. Woerheide, School of Management, University of Michigan-Flint, Flint, MI 48502-2186. Applications accepted until position is filled. The University of Michigan-Flint is an equal opportunity/affirmative action employer.

#133 SHIPPENSBURG UNIVERSITY, DEPARTMENT OF ACCOUNTING. Two positions are available commencing Summer or September 1988. Applicants should possess a Ph.D., or D.B.A. in Accounting; however, ABD, in accounting, or MBA with a CPA or CMA may be considered. Rank and salary are competitive and depend on qualifications. The normal teaching load is 12 hours with two preparations but reduced teaching loads for research are available. Applications should be received by February 15, 1988. Send letter of application and resumé to: Chairperson, Accounting Department Search Committee, 325 Shippen Hall, Shippensburg University, Shippensburg, PA 17257. Shippensburg University is an Equal Opportunity/Affirmative Action Employer. Women and racial minorities are encouraged to apply.

#134 RUTGERS UNIVERSITY, NEWARK, NEW JERSEY. TENURE TRACK POSITIONS IN ACCOUNTING. Rutgers-The State University of New Jersey, Department of Accounting in Newark invites applicants for tenure track positions in financial and managerial accounting. The department is AACSB accredited. These positions may be at the Assistant or Associate Professor levels. We are particularly interested in applicants who are committed to career goals in research and publication as well as teaching. Rutgers has excellent resources to support such interests and activities. The campus is located one-half hour from New York City. Interested candidates should submit a full curriculum vita to Dr. David J. Zaumeyer, CPA, Chairman, Department of Accounting, 254 Bradley Hall, Newark, New Jersey 07102. Rutgers is an Equal Opportunity/Affirmative Action Employer.

#135 THE UNIVERSITY OF TULSA SCHOOL OF ACCOUNTING is seeking a director (beginning Fall 1988). Qualifications include a doctoral degree and a research and teaching record which warrants Full Professor. The School has B.B.A., M.S. in Accounting and M.S. in Taxation programs, as well as M.B.A. offerings. The University of Tulsa has a strong undergraduate tradition in the Liberal Arts and stresses high quality teaching and research. Send vita to Don Vickrey, School of Accounting, The University of Tulsa, Tulsa, OK 74104. An equal opportunity/affirmative action employer.

#136 TRENTON STATE COLLEGE, ACCOUNTING. Two tenure track positions available. Ph.D. required for tenure; doctoral candidates invited to apply. The Accounting Department of 250 majors emphasizes small class interaction and quality teaching. Competitive salary, reduced first-year teaching load and research support. Resumés accepted until February 1, 1988 or until position is filled. Send vita to: Dr. Barbara Shilarappa, Department of Accounting, Trenton State College, CN4700 Hillwood Lakes, Trenton, New Jersey 08650-4700. Minorities and women are encouraged to apply. To enrich education through diversity, TSC is an AA/EOE.

#137 THE UNIVERSITY OF IOWA, DEPARTMENT OF ACCOUNTING. The Department of Accounting at the University of Iowa is seeking qualified applicants to fill permanent or visiting Assistant, Associate, and/or Full Professor positions beginning fall 1988. Principal qualifications are: (1) terminal degree (Ph.D. or DBA); (2) genuine interest in accounting research and in working closely with undergraduate and graduate students; (3) Senior Professors must have established record of quality teaching and research with demonstrated competence in directing doctoral theses; (4) all candidates must have long-term interest in teaching. Screening will begin upon receipt of a resumé sent to: Valdean Lembke, Head, Department of Accounting, College of Business Administration, University of Iowa, Iowa City, IA 52242. This announcement will remain open until all positions are filled. The University of Iowa is an equal opportunity and affirmative action employer.

#138 TEXAS TECH UNIVERSITY invites applications for permanent faculty positions in Accounting beginning Fall 1988. Positions are expected to be available at the assistant rank for teaching and research interest in taxation and financial accounting. Doctorate required. Certification desirable. Competitive salaries commensurate with experience and education. Texas Tech offers accounting programs at the undergraduate, masters, and doctoral levels. Apply to Professor Gay E. White, College of Business Administration, Texas Tech University, P.O. Box 4320, Lubbock, Texas 79409. Affirmative Action/Equal Opportunity Employer.

#139 POSITION WANTED teaching auditing. DBA, CPA, over twelve years teaching experience at the undergraduate and graduate (masters) levels. Excellent teaching evaluations. Recent publications in national practitioner journals. Presently Associate Professor with 10 month salary in low sixties. Desires position at college or university in the Mid-Atlantic, Southeast, or Southwest Region.

#140 VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY invites applications and nominations for the Arthur Andersen Alumni Professorship in Information for Management. Applicants/nominees should have a demonstrated record of excellence in research and teaching. The appointment will be at the senior level with compensation and research supplements provided by the professorship. The search will remain open until March 1, 1988 or until the position is filled. Applications and nominations should be sent to: Wayne E. Leininger, Department of Accounting, 222 Burruss Hall, Virginia Tech, Blacksburg, VA 24061. Virginia Tech is an Equal Opportunity/Affirmative Action Employer.

#141 KANSAS STATE UNIVERSITY seeks applicants for one anticipated position at the rank of Assistant or Associate Professor. Ph.D., D.B.A. preferred. Doctoral candidates within one year of completion will be considered. Appointment at Associate level requires four or more years of post doctoral experience and significant publications. Final review of applicants will begin February 15, 1988. Kansas State University, Department of Accounting, Calvin Hall, Manhattan, Kansas 66505. Affirmative Action, Equal Opportunity Employer.

#142 UNIVERSITY OF NORTH CAROLINA-ASHEVILLE—Tenure track faculty position in Accounting and Health Care Finance for Fall, 1988. Rank open. Doctorate in Accounting with health care experience or Doctorate in Health care with accounting certification needed. Successful applicant will teach undergraduate accounting and health-care finance courses, serve on departmental and institutional committees, be involved in professional activities, and do some research and publishing. UNCA is an undergraduate, liberal arts based university that emphasizes good teaching. UNCA is located in the beautiful Western North Carolina mountains. Send vita and names of three references to Martha Marshall, Recruiting Committee Chair, UNCA Management Department, Asheville, NC 28804-3299. Application review begins January 15, 1988; position open until filled. UNCA is an EEO/AA employer.

#143 ACCOUNTING-FACULTY POSITION—West Chester University seeks applicants for a full-time, tenure-track position for September, 1988. Duties include teaching at undergraduate and graduate levels, student advising, program development and professional development. Ph.D./DBA preferred, but ABD will be considered. Master's Degree with CPA/CMA may be considered for temporary positions. Professional experience in accounting required of all candidates. Rank and salaries commensurate with qualifications. Please send resumé postmarked by February 15, 1988 to: Dr. S. Theodore Hong, Accounting Department, WEST CHESTER UNIVERSITY, West Chester, PA 19383. AA/EOE. Women and minorities are encouraged to apply.

#144 ACCOUNTING POSITION. Tenure track position at assistant/associate professor level beginning September, 1988. Teaching assignment: Combination of lower and upper division accounting courses based upon candidates' coursework and/or teaching experience. Qualifications are: Ph.D. or D.B.A. preferred. Masters plus C.P.A. or C.M.A. encouraged to apply; demonstrated teaching ability and some evidence of professional and/or research capability; several years of full-time undergraduate experience for Associate rank; strong commitment to professional and academic excellence. Position open until filled, but applications received before January 31, 1988 will be given preference. Send letter of application, resumé, transcripts, and three letters of reference. An equal opportunity/affirmative action employer. CONTACT: Andre Corbeau, Dean, School of Business and Economics, Eastern Montana College, Billings, MT 59101-0298.

#145 POSITION DESIRED: PhD, CPA, CDP. Eighteen years teaching experience in Auditing, Accounting Systems, and Managerial Accounting. Publication record and outstanding teaching record. Desire temperate climate.

#146 LE MOYNE COLLEGE is seeking applicants for a tenure track position as Assistant or Associate Professor Accounting. A doctorate in accounting is required. Applicants should be excellent teachers, showing promise or evidence of ability to undertake a moderate amount of research. Le Moyne is a high quality, private, four year liberal arts college in the Jesuit tradition with a very successful accounting program which graduates approximately 85 majors per year. Le Moyne is situated on a beautiful campus on the fringe of Syracuse (in Central New York) which offers a full range of educational, cultural, and social activities as well as ready access to the recreation areas of the Finger Lakes and Adirondacks. Salary is competitive. Send vita to: Dr. Ronald L. Taylor, Department of Accounting, Le Moyne College, Syracuse, New York 13214. EEO/AA employer. (315) 445-4466.

#147 UNIVERSITY OF CINCINNATI, College of Business Administration, invites applications for the position of dean, which will become open in the summer of 1988. The successful candidate will be a strong leader with vision, effective management skills and a demonstrated commitment to excellence in teaching and research, and be qualified for a tenured professorship in the college. The College occupies a new facility equipped with electronic classrooms, extensive computer facilities, and a behavioral laboratory. Seven chairs/professorships, the College endowment fund and increasing private sector support enable the College to enhance its research and teaching activities. Nominations and applications should be accompanied by a curriculum vitae and references, and should be sent to: Tom Gerety, Chair, CBA Dean Search Committee, University of Cincinnati, Cincinnati, Ohio 45221-0040. AAEOE.

#148 LOYOLA COLLEGE IN MARYLAND invites applications for tenure-track accounting positions in managerial, international, financial, and tax at all ranks for September 1988. The College is actively pursuing AACSB accreditation. Faculty teach in undergraduate, MBA, and Executive MBA programs. There is a nine-person department and 90 senior majors. Research and publications are required and supported. Applicants must possess doctorate or equivalent; however, candidates nearing completion of dissertation will be considered. Reply to: John P. Guercio, Chairman, Department of Accounting, Loyola College, 4501 N. Charles Street, Baltimore, MD 21210. EEO/AAE.

#149 CALIFORNIA STATE UNIVERSITY-HAYWARD seeks applicants for tenure-track faculty positions in accounting beginning Fall 1988. Ph.D. (or A.B.D. near completion) required. Assistant Professor positions in financial, managerial, cost, and auditing. July 1, 1987 salary ranges for nine months: Assistant Professor—$31,488 to $41,496; Associate Professor—$36,156 to $48,708; Full Professor—$44,352 to $53,508. A 6.9 percent increase is effective January 1, 1988. Teaching assignments will include instruction at the undergraduate and/or graduate levels in a department that has an excellent reputation. Hayward, located across the Bay from San Francisco, has attractive residential areas. There are ample opportunities for research and consulting with business and other entities in this diversified metropolitan community. Qualified candidates should send letters of application and resumés to Wade A. Morehouse, Director of Recruiting, Department of Accounting, California State University-Hayward, Hayward, California 94542. The University seeks to create a stimulating atmosphere for its ethnically diverse student body. Women and ethnic minority faculty are especially encouraged to apply.

#150 UNIVERSITY OF ALABAMA AT BIRMINGHAM has positions available, Fall 1988, all ranks. Doctorate required; but ABD considered for assistant. Certification desirable. Prefer applicants with strong interests in tax, systems, or auditing. Contact: Loudell Robinson, Accounting Department, University of Alabama at Birmingham, University Station, Birmingham, Alabama 35294. Equal Opportunity/Affirmative Action Employer.

#151 THE UNIVERSITY OF AKRON (AACSB accredited) invites applications for tenure-track positions as Assistant Professor of Accounting (other ranks subject to qualifications and departmental needs), beginning Fall semester 1988. An earned doctorate (Ph.D. or DBA) and professional certification are desired. ABDs are also invited to apply. Candidates should be committed to excellence in teaching and scholarly productivity. The Department of Accounting offers the BS, MBA, and Master of Taxation degrees. Consideration will be given to all vitas received by March 1, 1988. Please mail to Dr. Richard W. Metcalf, Head, Department of Accounting, College of Business Administration. The University of Akron, Akron, OH 44325. The University of Akron is an Equal Education and Employment Institution.

#152 THE EUROPEAN INSTITUTE OF BUSINESS ADMINISTRATION is seeking to expand its accounting and control faculty. Expansion is required to meet the growing demands of MBA and executive programmes and to respond to research opportunities. Career and visiting positions are available at all ranks. Conditions of employment are competitive and negotiable. There is a tenure system for senior faculty. Successful candidates will have or be completing a Ph.D. (or equivalent), be managerial in orientation, enjoy teaching MBA's and executives, use microcomputers in their courses and be active in positive accounting research. The primary language of instruction is English. Reply to: Deigan Morris, Area Coordinator, Accounting and Control Area, Insead, Boulevard de Constance, 77305, Fontainebleau Cedex, France.

#153 LONGWOOD COLLEGE. The School of Business and Economics seeks applications for a faculty position in Accounting. A doctoral degree is preferred but ABD will be given serious consideration. Rank is open depending upon qualifications. Longwood College, a state supported school, has approximately 2,900 students including 755 majors in the various business programs. The College is located in Farmville, VA, 60 miles west of Richmond. Longwood College is committed to excellence in teaching. Applications should be sent to Mr. Tom Baynham, Director of Employee Relations, Longwood College, Farmville, VA 23901. AA/EOE.

#154 TULANE UNIVERSITY, The A. B. Freeman School of Business is seeking a research-oriented faculty member in financial accounting or managerial accounting to fill a tenure-track position. Salary and benefits are highly competitive. A proven publication record is required for senior ranks. Please send resumé to Soliman Y. Soliman, PH.D., Area Coordinator—Accounting and Taxation, A. B. Freeman School of Business, Tulane University, New Orleans, Louisiana 70118-5669. Tulane University is an Equal Opportunity/Affirmative Action Employer.

#155 DEPARTMENT HEAD, PORTLAND STATE UNIVERSITY. The Department of Accounting invites nominations and applications for a Head starting on or before July 1, 1989. Candidates should possess a doctorate, preferably with accounting as a major area of study. Applicants should have established credentials in the areas of teaching, research, and service to support a senior-level faculty appointment. The candidate must be willing and able to maintain a strong relationship with the professional community and should have a professional certification. The Head provides leadership to 17 full-time faculty. One of four departments in the School of Business Administration, the Department of Accounting offers undergraduate instruction and a graduate program leading to the Master of Taxation. Send vita to Dr. Michael R. Gaines, Head, Department of Accounting, P.O. Box 751, Portland, OR 97207-0751. Application deadline is May 15, 1988. PSU is an equal opportunity affirmative action employer. Minorities, women, and members of other protected groups are encouraged to apply.

#156 PORTLAND STATE UNIVERSITY located in Portland, Oregon, invites applications for an expected permanent appointment in accounting. The available position is at the Assistant or Associate level. Research and teaching in taxation or accounting required. Applicants should possess a doctoral degree in accounting although candidates at an advanced dissertation stage will be considered. Performance evaluation at PSU is based upon effective classroom teaching, research and publication, and university and community service. Programs are offered at both the undergraduate and graduate levels. The department enjoys a very close relationship with the professional accounting community in the state. Vita should be directed to Dr. Michael R. Gaines, Head, Department of Accounting, Portland State University, Portland, Oregon 97207-0751. Application deadline is April 15, 1988 or until the position is filled. PSU is an equal opportunity affirmative action employer. Minorities, women, and members of other protected groups are encouraged to apply.

#157 CORPUS CHRISTI STATE UNIVERSITY is seeking applications for a tenured-track position in accounting beginning Fall 1988. Rank and salary are open depending upon qualifications. Ph.D. or DBA in accounting is required (ABD's will be considered), professional certification is preferred. The University places a balanced emphasis on teaching and research. Send resumé to Professor W. F. Rylander, Accounting Search Committee, Corpus Christi State University, 6300 Ocean Drive, Corpus Christi, Texas 78412. An Affirmative Action/Equal Opportunity Employer.

#158 BITTING PROFESSORSHIP IN ACCOUNTING, ELIZABETHTOWN COLLEGE—Elizabethtown College invites applications and nominations for the endowed professorship in accounting, honoring Professor Emeritus Edgar T. Bitting for his outstanding service as Accounting Professor and Chairman, Department of Business. Candidate should possess academic credentials in accounting commensurate with the rank of associate or full professor, and/or a distinguished career in the accounting profession. Position available Fall 1988. Initial screening November 30, 1987. Send nominations, letter of application, credentials including transcript, and three current references to Martha A. Farver-Apgar, Director of Personnel, Elizabethtown College, Elizabethtown, Pennsylvania 17022. AAEO.

The Journal of INFORMATION SYSTEMS

Volume Two • Number One Fall 1987

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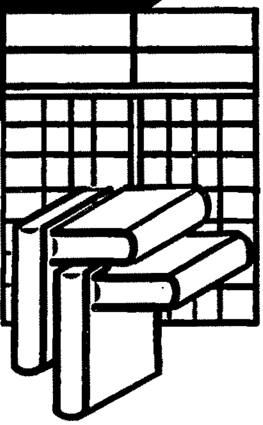

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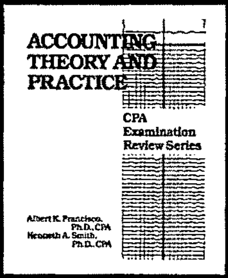

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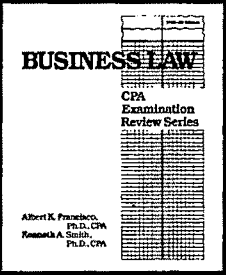

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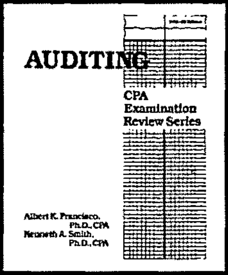

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The Centre for the Advancement of Professional Accounting Education at the University of Alberta is seeking a new Director. The position offers a unique career challenge for an individual eager to be on the cutting edge of accounting research and education.

The Director will have an academic appointment, at the full professor or associate professor level, in the Department of Accounting. The Department is part of a strong business school which has well-established accredited undergraduate, M.B.A., and Ph.D. programs. Salary will be competitive and commensurate with qualifications and duties.

The Centre provides administrative and financial support for developing educational materials and accounting courses that emphasize skill development, particularly judgement and decision making skills. The Centre may sponsor research into the nature of these skills and how they may be taught.

Interested parties should apply in writing before July 1, 1988 to:

Dr. John Waterhouse
Department of Accounting
Faculty of Business, University of Alberta
Edmonton, Alberta, Canada T6G 2R6

The Nicholas M. Salgo Professorship

THE UNIVERSITY OF MAINE

The College of Business Administration at the University of Maine requests nominations and applications for the Nicholas M. Salgo Professorship of Business Administration. Candidates should have an outstanding record in research, publication and teaching in one or more fields of business administration, and a demonstrated willingness to interact with the business community.

The position is available commencing September 1, 1988. Nominations and applications are sought from individuals currently holding the Associate or Full Professor rank. Application for consideration may be made by submitting a letter of interest and a vita to W. Stanley Devino, Chair, Nicholas M. Salgo Professorship Search Committee, College of Business Administration, University of Maine, Orono, ME 04469-0158. The University of Maine is an equal opportunity/affirmative action employer.

FACULTY POSITION

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Alfred P. Sloan School of Management

The Sloan School's accounting group is seeking new faculty at both senior and junior levels effective July 1, 1988. Applicants for junior positions will be judged on their potential for excellence in research and teaching, although preference will be given to applicants who can submit completed research. Applicants for senior positions should have demonstrated excellence in research and teaching.

The intellectual environment in the accounting group at MIT's Sloan School is particularly stimulating, and offers new faculty members numerous possibilities for productive interaction with distinguished scholars in the associated applied economics and finance groups.

MIT is an equal opportunity employer and encourages applications from women and minorities.

Applications should be sent to:

Professor Paul Healy
Chairperson, Search Committee
Massachusetts Institute of Technology
Sloan School of Management
50 Memorial Drive, Room E52-434
Cambridge, MA 02139

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SCHOOL OF ACCOUNTANCY

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The anticipated date for the appointment is September 1, 1988.

Nominations and applications should be sent by January 31, 1988 to:

Dr. Marie E. Dubke, C.P.A.
Chairman, Search Committee for
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School of Accountancy
Fogelman College of Business & Economics
Memphis State University
Memphis, TN 38152

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ACCOUNTING FACULTY POSITIONS

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Rank and Salary:	Open
Starting Date:	September 1, 1988

Indication of sex and ethnicity for Affirmative Action statistical purposes is requested, but not required. Applicants should send a complete curriculum vita, including background, experience, research and publications, and references to:

Academic Search #489
The University of Texas at Dallas
P.O. Box 830688
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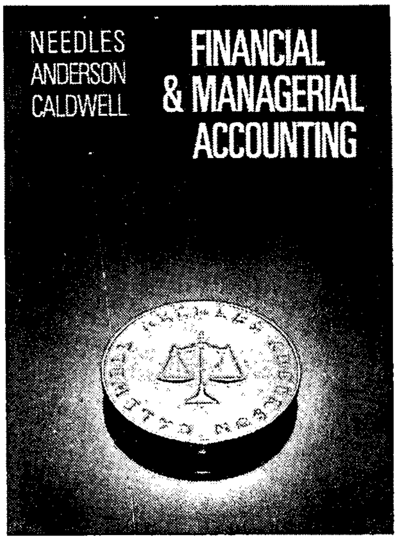

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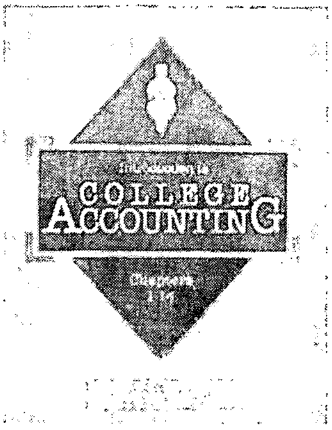

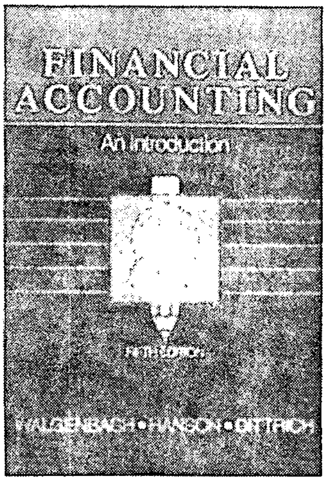

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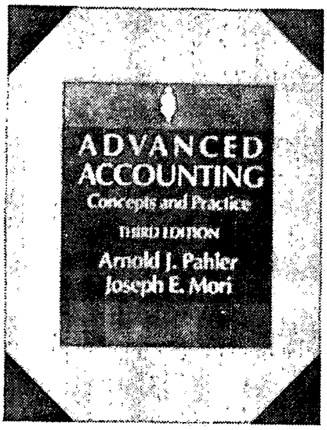

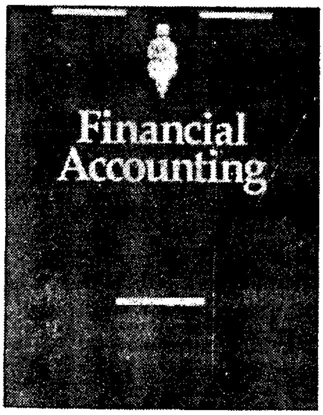

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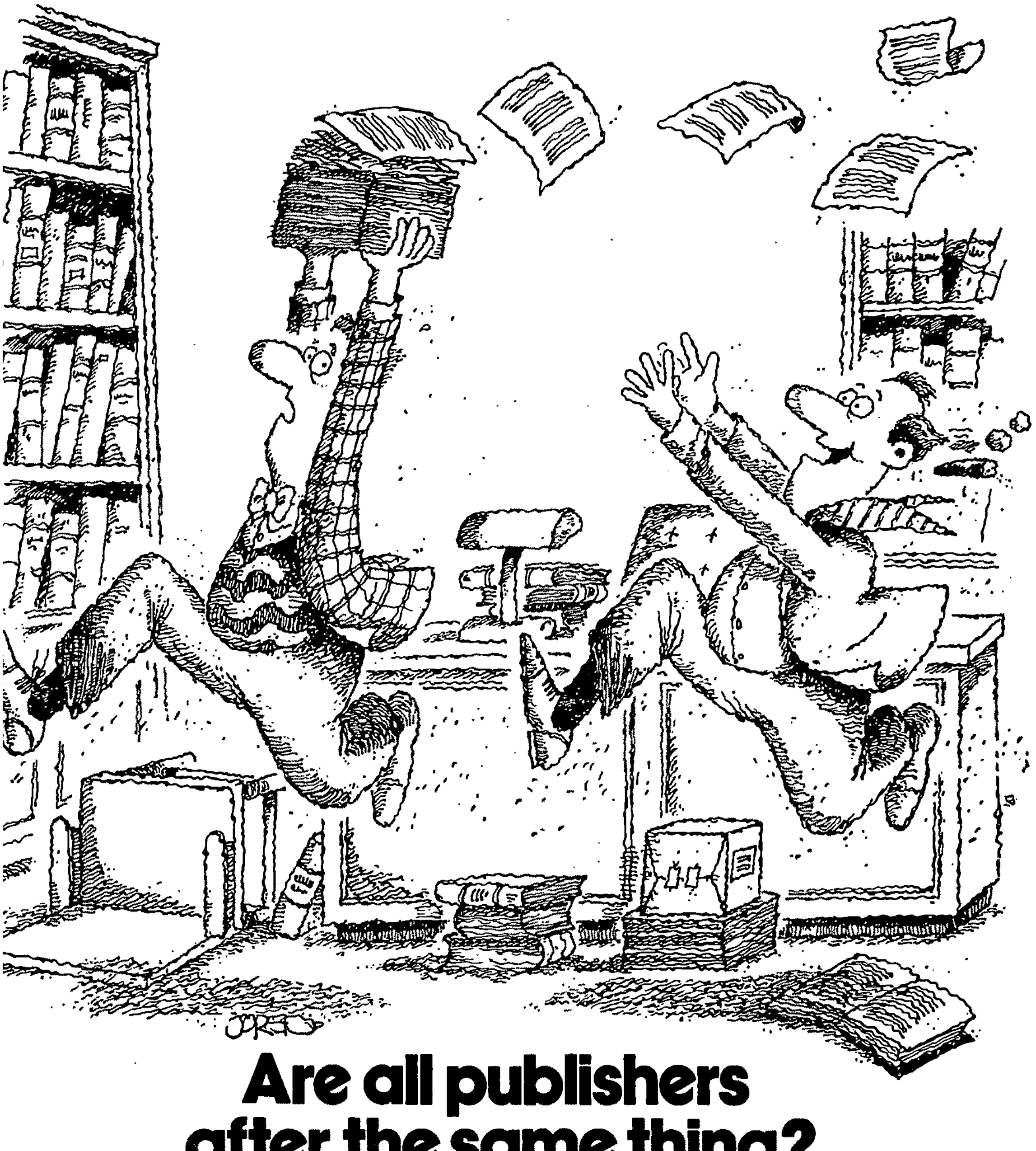

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Product Pricing, Accounting Costs and Use of Product-Costing Systems

Ronald W. Hilton, Robert J. Swieringa, and Martha J. Turner

ABSTRACT: The economic theory of the firm suggests that a profit-maximizing product price may be determined by equating marginal cost and marginal revenue. Yet recent surveys suggest that most firms use cost-based pricing strategies where product costs are determined using absorption costing. Lere [1986] has drawn upon the economic theory of the firm, as well as extensive work on heuristic decision processes, to develop an empirically testable theory of product pricing based on accounting costs. This paper reports the results of an experiment in which Lere's theory was empirically tested.

The economic theory of the firm under certainty suggests that a profit-maximizing product price may be determined by equating marginal cost and marginal revenue. Sandmo [1971], Leland [1972], and Coes [1977] have generalized this theory under conditions of uncertainty and risk aversion on the part of the decision maker (DM). In these theories of product pricing, there is no role for product-cost information as it is typically generated by cost accounting systems. Yet several recent surveys (e.g., Gordon et al. [1981] and Govindarajan and Anthony [1983], as well as anecdotal evidence, suggest that accounting product costs are widely used as a basis for setting product prices. One rationale for this phenomenon is a recognition of the costliness of setting prices in accordance with the expected utility maximizing approach under the economic theory of the firm. The information necessary for the DM to equate marginal cost and marginal revenue is costly to obtain. Moreover, the analysis required for expected-utility analysis is a costly process. Due to bounded rationality and the cost of obtaining complete information, DMs employ rules of thumb, heuristics, and satisficing algorithms in making decisions.

Under this general rubric of bounded rationality and costly information, it has been argued that accounting product costs may act as surrogates for marginal costs, and that DMs use these accounting

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Ronald W. Hilton is Professor of Accounting, Cornell University, Robert J. Swieringa is a Member of the Financial Accounting Standards Board, and Martha J. Turner is a Ph.D. Candidate, Cornell University

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costs in heuristic methods of price setting. Under this view, product costs computed under a variable-costing approach provide better surrogates for marginal cost than do product costs computed under an absorption-costing approach. Yet surveys report considerable usage of absorption costing as a basis for setting product prices. For example, Govindarajan and Anthony [1983, p. 36] conclude that "most large companies use full costs, rather than variable costs," as the basis for setting prices, and a similar conclusion is drawn by Gordon et al. [1981].

Lere [1986] has drawn on the economic theory of Sandmo [1971] and Leland [1972], as well as the extensive work on heuristic decision processes of Simon [1955], Baumol and Quandt [1964], Day [1967], and Anderson [1980] to develop an empirically testable theory of product pricing based on accounting costs. Lere [1986] shows that under certain plausible heuristic processes of price-setting behavior, there are scenarios under which the use of either variable costing or absorption costing as a basis for product pricing may result in a price that is closer to the utility-maximizing price. The conditions that characterize these scenarios include: (1) the nature of the demand function (deterministic or stochastic), (2) the nature of the cost function (deterministic or stochastic), (3) the shape of the cost function (linear or nonlinear), and (4) the risk attitude of the DM. Thus, Lere's research represents a behavioral theory of accounting product-costing system choice and use based on the economic theory of the firm and the theory of human information processing. As such, Lere's research provides an opportunity to test a theory about product pricing and accounting product-costing method choice that is based on concepts in human information processing. In a related study, Dickhaut and Lere [1983] developed a theory of product-costing system choice and use in the context of production quantity decisions.

The purpose of this paper is to report the results of an experiment in which we empirically tested several hypotheses based on Lere's [1986] work. The paper is organized as follows. The next section discusses the theory upon which the hypotheses are based. The third section describes the hypotheses and the experimental method used to test them. The fourth section reports the results of the experiment. The last section discusses the findings and concludes the paper.

THEORY

Complete Analysis

Consider a firm with a single product for which the DM sets a price, p, and then production is subsequently set equal to the demand at that price. The firm's downward-sloping demand function is denoted by $q(p)$. Thus, the total revenue function is as follows, where R denotes total revenue.

$$R = pq(p) \tag{1}$$

The firm's cost function is denoted by $C(q(p))$. Thus profit, π, is given as follows:

$$\pi = pq(p) - C(q(p)) \tag{2}$$

If the demand function and cost function are known with certainty, the profit-maximizing price is determined by setting $d\pi/dp$ equal to zero, which yields the following:

$$pq'(p) + q(p) = C'(q(p))q'(p) \tag{3}$$

More generally, if either the demand function or the cost function is stochastic, the expected-utility-maximizing price is characterized by the following first-order condition (where $u(\cdot)$ denotes the DM's utility for profit):[1]

$$E\{u'[pq(p)-C(q(p))] \\ [pq'(p)+q(p)-C'(q(p))q'(p)]\} = 0 \quad (4)$$

Heuristic Analysis

In order to carry out the optimization procedure in either (3) or (4), the DM must know the marginal cost function, $C'(q)$. If marginal cost information is costly to obtain, or if the DM is subject to bounded rationality, a heuristic price-setting procedure may be employed instead of the procedure characterized by (3) or (4). As part of this heuristic procedure, the DM may use a surrogate for marginal cost.

In the theory developed by Lere [1986], the DM is assumed to be subject to bounded rationality, and marginal cost information is assumed to be costly. Consequently, the DM is assumed to follow a heuristic procedure in setting the product price. This heuristic procedure is consistent with the theory and empirical evidence that addresses such heuristic procedures represented by Simon [1955], Baumol and Quandt [1964], and Day [1967], and more recently by Anderson [1980], Shugan [1980], and Radner [1975]. Such heuristic procedures are characterized by limited search, sequential information-processing behavior, a tendency to make few calculations, and a reliance on expectations to deal with uncertainty.

In the theory tested below, the DM is assumed to follow a heuristic price-setting procedure with the following features [Lere, 1986, p. 320]:

1. The DM uses the accounting product cost (denoted by *PC*), calculated under either variable or absorption costing, as a surrogate for marginal cost, $C'(q)$. The DM obtains *PC* from an accountant, who supplies *PC* based on the expected quantity demanded at a potential price suggested by the DM. When the cost function is stochastic, the accountant computes *PC* on the basis of the expected cost function given the quantity demanded at the DM's suggested price. The details of the calculation of *PC* will be explained below.
2. The DM attempts to set the product price in accordance with the following equation:

$$E[pq'(p)+q(p)] \\ = PC \cdot E[q'(p)] \quad (5)$$

Thus, the DM uses a simplified information system that supplies *PC* instead of $C'(q)$, and the DM simplifies the choice process by relying on expectations rather than expected-utility maximization. When demand and cost are deterministic, (5) reduces to (3) except that $C'(q)$ is still replaced by *PC*.

3. The DM sets a final product price by engaging in an iterative procedure that involves interaction with an accountant. The DM first suggests a price. Then the accountant responds by calculating the accounting product cost given the quantity demanded (or expected quantity demanded) at the price suggested by the DM. The DM uses *PC* as reported by the accountant to evaluate (5). The DM then suggests a new price by moving the price in the direction necessary to bring the left-hand and right-hand sides of (5) toward equality. The accountant responds with a new *PC* given the DM's new suggested

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[1] We assume an interior solution and sufficient regularity for all of the functions involved, so that the optimum is characterized by the first-order condition.

> price. This interative procedure continues until the DM is satisfied with the price and finalizes it.[2]

An alternative version of a heuristic process was suggested by Dickhaut and Lere [1983] in a production-quantity choice setting. Under the Dickhaut and Lere heuristic procedure, the DM determines price changes by focusing on the induced change in expected profit. The DM seeks information on the direction of expected profit change for a given change in the product price. Expected profit is easily calculated by the DM using price, expected demand given price, and the accounting product cost as reported by the accountant (under either variable or absorption costing). If the DM determines that expected profit is higher at the higher of two prices, the DM requests a measure of unit product cost from the accountant and then computes expected profit at a still higher product price. This process continues in this direction until expected profit declines, at which point the process is reversed, using smaller decrements in price than the previous increments. The price chosen is the one at which there is an expected profit decrease as a result of a price change in either direction. Thus, this heuristic price-setting procedure entails an iterative process between the DM and the accountant. The DM selects a price, the accountant responds with a unit product cost consistent with the demand at the DM's suggested price, the DM makes a simple calculation of expected profit, and then suggests a new price. This iterative procedure continues until the DM finalizes the price.

Results of tests for both of these heuristic processes are reported below.

PURPOSE OF THE EXPERIMENT

The theory developed by Lere [1986] focuses on the type of accounting product-costing system that would lead to heuristic prices closer to the optimal price if the DM were to use that product-costing system in conjunction with Lere's heuristic price-setting procedure. Lere demonstrates that under some scenarios, the heuristic procedure yields a price closer to the expected utility maximizing price if the DM is given variable-costing (*VC*) information. Under other scenarios, however, the heuristic yields a price closer to the expected utility maximizing price if absorption-costing (*AC*) information is provided. The characteristics that determine whether *VC* or *AC* yields a price closer to the optimal price relate to the type of demand function, the nature of the production cost function and the risk attitude of the DM. The details of the analysis are available in Lere [1986].[3] A summary of Lere's conclusions, as well as some details and insight about them, are provided in the next section.

The purposes of the experiment described in the remaining sections of this paper are as follows:

1. To test the descriptive validity of the price-setting heuristics described in the preceding section. We focus on (a) the extent to which the prices chosen by the subjects in the experiment conform to those predicted under the two heuristic price-set-

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[2] The form of the heuristic used by Lere [1986] and assumed here concentrates only on the cost side of the equation of marginal revenue and marginal cost. We acknowledge this as a limitation of the research. The DM must understand the concepts of marginal revenue and marginal cost and know how to use them to find the optimal price. But the DM is limited in the ability to determine marginal cost and relies instead on accounting product-cost information. Yet, as will be explained later, the DM is assumed to perceive those circumstances when use of variable or absorption costing will help overcome the shortcomings of the heuristic analysis.

[3] In addition to the published work, Lere [1986], additional details of the analysis are available in Lere [1984].

ting methods, and (b) the relation between the direction of the price change on each price-setting iteration and the price-change direction predicted under each heuristic. We also examine the extent to which subjects were able to converge to a price using each heuristic procedure and the extent to which subjects "learned" the heuristic as they gained experience in the experiment.

2. To determine the extent to which the subjects' price-setting behavior corresponds to that specified by the complete analysis.
3. To determine the extent to which the subjects tended to select the product-costing system that, when used in conjunction with Lere's heuristic, would result in a product price closer to the optimal price.[4]

METHOD

Subjects

The subjects were 63 MBA students in a graduate school of business. Subjects were recruited to participate in the experiment and were guaranteed a minimum payment of $5.00 and provided with an opportunity to earn as much as $30.00 for roughly 75 minutes of their time. The experiment was conducted over a period of five days in supervised sessions of 11 to 15 subjects each. Subjects were asked not to discuss the experiment with anyone until the conclusion of the experiment.[5] Subjects were recruited from a pool of individuals who had not yet taken a course covering accounting product-costing methods. This criterion was imposed since the study includes the choice of *VC* or *AC* product-costing methods, and exposure to such a course could bias subjects' perceptions of the relative merits of these approaches. The subjects had taken courses in microeconomics and calculus.

A pretest of the experiment was conducted on a different set of subjects. Based on the results, several changes were made to clarify the subjects' instructions and improve the experimental design.

Risk Attitude of Subjects

The experimental design required determination of the extent to which the subjects exhibit risk averse behavior. The subject pool was divided into two groups, one that was classified as risk neutral and one that was classified as risk averse. A post-experimental utility-elicitation instrument was administered interactively via the computer. Each subject's utility function was elicited in the range $0 to $100 by eliciting certainty equivalents for a series of ten hypothetical binary gambles. The set of gambles varied from subject to subject because a subject's elicited certainty equivalents for early gambles determined the subsequent gambles presented to the subject.[6]

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[4] While the thrust of Lere's research is to demonstrate those conditions under which *VC* or *AC* yields the price closest to the optimal price, Lere suggests that his results could be the basis for a theory of product-costing system choice [Lere, 1986, p. 321].

[5] We have only anecdotal and indirect evidence that this admonition was heeded. First, we casually asked several subjects if they had heard about the details of the experiment. None indicated that they had. Second, if the subjects in the latter groups were more familiar with the task than those in the earlier groups, one might expect the earnings of the latter groups to be higher and/or the time required by the latter groups to complete the experiment to be less. There were no significant differences in either of these indicators among the experimental groups.

[6] We note that only hypothetical gambles were used in the utility-elicitation instrument. The subjects did not actually play the gambles. We acknowledge the imperfection of such utility-elicitation devices, and will indicate later in the paper where misclassification of subjects as risk neutral or risk averse could materially affect the results. We further note that the elicitation of utility

We used the following procedure to classify subjects according to their degree of risk aversion. For each subject, the certainty equivalent was calculated for each of the gambles faced by that subject under each of the following three classes of utility functions and for each of the indicated values of the parameter γ:

Utility Functions Used to Classify Subjects by Degree of Risk Aversion

---

Power Utility Function:

$$u(x)=x^{\gamma},$$
$$\text{where } \gamma \epsilon \{.30, .37, .44, \ldots, 1.0\} \qquad (6)$$

Exponential Utility Function:

$$u(x)=-e^{-\gamma x},$$
$$\text{where } \gamma \epsilon \{.001, .011, .021, \ldots, .101\} \qquad (7)$$

Logarithmic Utility Function:

$$u(x)=\ell n(x+\gamma),$$
$$\text{where } \gamma \epsilon \{1, 101, 201, \ldots, 1001\} \qquad (8)$$

For each class of utility functions, we calculated the mean squared error between the subject's vector of elicited certainty equivalents and the vector of certainty equivalents calculated for that class of utility functions under each of the parameter values for that class. Then for each class of utility functions, we chose the parameter value which yielded the minimum mean squared error for that utility class and that subject. The result was the parameter that gave the best approximation of each subject's risk preferences under each class of utility functions. Then all subjects, under each class of utility functions, were ranked by their degree of risk aversion as evidenced by the parameter selected for each subject under each utility function class. The result was three rankings of subjects by degree of risk aversion (one ranking for each utility class). The three ranks were summed for each subject and the subjects reranked according to their summed ranks. We then examined the listing of summed ranks and found a large discontinuity, at which point we divided the subjects into two groups. As a result of this procedure, 14 subjects were classified as risk averse and 49 subjects as essentially risk neutral. Plots of the subjects' utility functions were examined to corroborate the objective classification. All of the subjects objectively classified as risk neutral had essentially linear utility functions. The vast majority of these functions were straight lines.

There was very little difference among the final objective ranking of subjects (using the summed ranks across all three classes of utility functions) and the ranking of subjects for each individual class of utility functions. Moreover, there was no difference among these four objective classifications with regard to the sets of subjects classified as risk neutral versus

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functions using hypothetical gambles is common in studies that require a classification of subjects according to their risk attitude. Moreover, there are problems inherent in using real money in the gambles. Many universities, including ours, prohibit experiments involving gambles wherein the subjects could actually lose some of their own money. Consequently, the experimenter must provide a stake to each subject with which the subject will gamble. Then the concern arises, however, that the subjects will behave differently in gambles using this "free money" than they would in gambles using their "own money." Thus, even under this approach, the gambles take on a "hypothetical" feeling. Moreover, to have the subjects actually play gambles involving the amounts of money involved in the experimental task would be prohibitively expensive. If each subject played ten gambles involving amounts ranging from zero to 50 dollars, it would cost over $100 per subject just to elicit the utility function. We also note that subjects' utility functions were elicited over their wealth, not the profit that would be earned in the experiment, which would then have subsequent implications for their wealth. This contributes to problems in classifying the subjects as risk neutral or risk averse. Parts of the study do rely on the ability to classify subjects as risk neutral or risk averse and we acknowledge this as a limitation.

risk averse. We conclude, therefore, that the classification of subjects as risk neutral or risk averse is relatively robust.

Experimental Task

The subjects performed the experimental task interactively with the computer. The role of each subject was that of a price-setting DM who could request accounting product-cost information from an accountant simulated by the computer. The subjects' instructions are included as Appendix A. After reading the instructions, subjects were asked several multiple-choice questions. Incorrect subject responses were followed by guidance to help the subject review the relevant part of the instructions. The purpose of this procedure was to ensure that the subjects understood the instructions.[7]

The subjects were informed in the instructions that they would face several experimental trials. In each trial, the subject would know the nature of the demand function and whether it was deterministic or stochastic. The demand functions were displayed to each subject on large cardboard exhibits to which they could refer throughout the experiment. These exhibits are shown in Exhibit 1.[8]

The subjects were also informed in the instructions that on each experimental trial there would be a cost function. The cost function on each trial had a fixed-cost component and a variable-cost component. The total fixed-cost component did not change with respect to changes in quantity produced, while the total variable cost did. The subjects were also told that on some trials the variable-cost component would be linear, implying constant marginal increments in total variable cost with respect to changes in the quantity produced. On other trials, the variable-cost component would be nonlinear with increasing marginal increments with respect to changes in the quantity produced. Moreover, the subjects were told that on some trials there would be only one cost function which could occur (the deterministic case), while on other trials there would be several possible cost functions that could occur probabilistically (the stochastic case). The subjects were not shown the specific cost functions and probability distribution used but were told that there would be no relation among the cost functions on different trials. On each trial the subject was told whether the cost function would be linear or nonlinear and deterministic or stochastic. To summarize, on each trial each subject knew the following:

1. Whether the demand function was deterministic or stochastic, and the exact form of the demand function (or possible functions).
2. Whether the cost function was linear or nonlinear and whether it was deterministic or stochastic.[9]

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[7] Very few incorrect responses were given, so we conclude that the subjects understood the instructions well. The terms "deterministic" and "stochastic" were used in the subjects' instructions. However, the meanings of these terms in the experiment were also defined in the instructions in laymen's terms. The subjects in the study had all been exposed to these terms prior to the study.

[8] The term "derivative" was used on the cardboard exhibits displaying the demand functions, but only after its meaning was described in laymen's terms. All of the subjects in the study had been exposed to this term prior to the study.

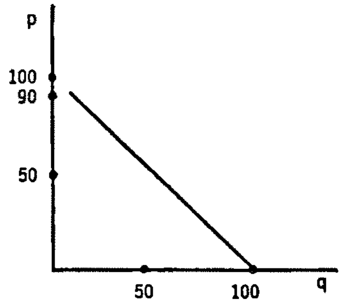
[9] In characterizing the scenarios as having either deterministic or stochastic cost functions, we are using Lere's [1986] terminology. However, in neither case did the subjects see the cost functions. Thus, the case of a deterministic cost function must be interpreted as an unknown but deterministic cost function, whereas the case of a stochastic cost function must be interpreted as a stochastic cost function where the DM does not know the probability distribution over the cost function. Although the terminology is somewhat loose, the distinction between the deterministic and stochastic cases really involves the way in which the accountant is assumed to compute product costs. When the cost function is stochastic, the accountant bases the calculation on expected cost.

EXHIBIT 1

DEMAND FUNCTIONS AS DISPLAYED TO SUBJECTS

DETERMINISTIC DEMAND FUNCTION

This is the demand function which will occur with certainty in those trials where you know the demand function. Quantity demanded is denoted by q and price is denoted by p.



DEMAND FUNCTION
$q=100-p$, for $0 \leq p \leq 90$

TOTAL REVENUE FUNCTION
(Price times quantity demanded)

Total revenue $=p(100-p)$

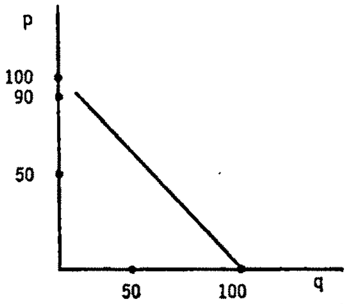
RATE OF CHANGE IN TOTAL REVENUE WITH RESPECT TO PRICE
(Derivative of total revenue with respect to price)

Rate of Change $=100-2p$

STOCHASTIC DEMAND FUNCTION

These are the two equally likely demand functions in those trials where there is uncertainty about demand. Quantity demanded is denoted by q and price is denoted by p.

DEMAND FUNCTION ONE



DEMAND FUNCTION
$q=100-p$, for $0 \leq p \leq 90$

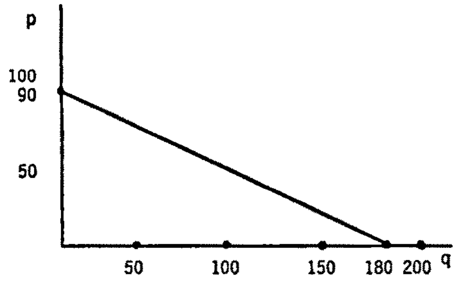
TOTAL REVENUE FUNCTION
(Price times quantity demanded)

Total revenue $=p(100-p)$

RATE OF CHANGE IN TOTAL REVENUE WITH RESPECT TO PRICE
(Derivative of total revenue with respect to price)

Rate of Change $=100-2p$

DEMAND FUNCTION TWO



DEMAND FUNCTION
$q=180-2p$, for $0 \leq p \leq 90$

TOTAL REVENUE FUNCTION
(Price times quantity demanded)

Total revenue $=p(180-2p)$

RATE OF CHANGE IN TOTAL REVENUE WITH RESPECT TO PRICE
(Derivative of total revenue with respect to price)

Rate of Change $=180-4p$

EXHIBIT 2
EXPERIMENTAL TREATMENTS

Demand (*Deterministic or Stochastic*)	*Cost* (*Deterministic or Stochastic*)	*Linear Cost Function* (L)	*Nonlinear Cost Function* (NL)
Deterministic (*D*)	Deterministic (*D*)	*DD/L*	*DD/NL*
Deterministic (*D*)	Stochastic (*S*)	*DS/L*	*DS/NL*
Stochastic (*S*)	Deterministic (*D*)	*SD/L*	*SD/NL*

The cost functions that we used are displayed below:

Cost Functions
(Not Shown to Subjects)

Deterministic, Linear:

$$C(q)=500+10q \tag{9}$$

Deterministic, Nonlinear:

$$C(q)=500+q^2/5 \tag{10}$$

Stochastic, Linear:

$$C(q)=\begin{cases}500+10q, \\ \quad \text{with probability } .5 \\ 500+6q, \\ \quad \text{with probability } .5\end{cases} \tag{11}$$

Stochastic, Nonlinear:

$$C(q)=\begin{cases}500+q^2/5, \\ \quad \text{with probability } .5 \\ 500+q^2/3, \\ \quad \text{with probability } .5\end{cases} \tag{12}$$

Before facing any actual experimental trials, each subject had a practice session with an unlimited number of price-setting iterations. The purpose of the practice session was to familiarize the subjects with the experimental task and with the accounting product-costing systems.[10] After completing the practice session, each subject faced 12 experimental trials, two under each of the six experimental treatments shown in Exhibit 2. The order in which subjects faced the treatments was randomized across subjects.

The subjects were told in the instructions that on each trial, after being informed of the nature of the demand and cost functions on that trial, they would be asked to specify either of two types of cost-accounting report: variable costing (*VC*) or absorption costing (*AC*). If a variable-costing report was chosen, the computer reported a unit cost that was the total variable cost, at the given level of demand, divided by the number of units demanded. If an absorption-costing report was chosen, the computer reported a unit cost figure that was the total cost (fixed and variable), at the given level of demand, divided by the number of units demanded. In both types of costing reports, on trials when the variable-cost component of the cost function was stochastic, the computer used the expected value of cost instead of actual cost in computing the unit cost figure to be reported. Moreover, in both types of cost-accounting reports, on trials when demand was stochastic, the computer used the expected value of demand, instead of actual demand, in computing the unit cost figure to be reported. The subjects were also informed that on no trial would both demand and cost be stochastic.

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[10] The subjects were limited in the practice session to only one experimental setting and one choice of a product-costing system.

Each trial proceeded as follows. The computer informed the subject whether demand was deterministic or stochastic, whether the cost function was deterministic or stochastic, and whether its variable component was linear or nonlinear. Then, the subject selected the cost-accounting report type to be received throughout the trial. Each subject had up to ten opportunities to set a tentative price for the product. Each time a tentative price was set, the computer determined the demand (or expected demand). If the subject wished, given this demand level, the computer provided a cost-accounting report of the type selected at the beginning of the trial. The computer also reported to the subject the expected demand level at the price suggested by the subject. Based on the subject's knowledge of the demand function and the cost-accounting report, the subject could make any calculations necessary to use the heuristic procedure and then either try another tentative price, or fix the price permanently at a particular level.[11] The final price could be any of the tentative prices on the trial, including the last price, or even one (within the proper range of values) for which the subject had no cost or demand information.

Once the subject determined the final price, the computer used that price to determine demand and total revenue in accordance with the demand function for that particular trial. Given the realized level of demand, the computer determined total cost in accordance with the cost function for that particular trial.[12] The demand, revenue, cost, and net profit were then reported to the subject, as well as the cumulative profit for all trials encountered up to that point. The experiment consisted of 12 trials. The subject's payment for participating was a fixed percentage of the total profit earned by the subject across all of the trials.

Hypotheses About Price Setting Based on the Heuristic Procedure

Lere's [1986] study focused on the implications of the product-costing system for price setting under various conditions of demand, cost, and risk attitude. As the basis for this theory, Lere assumed that the DM employs the heuristic price-setting procedure characterized by equation (5). In our experiment, we addressed the heuristic procedure by examining the data to see if the subjects' price-setting behavior appears to be consistent with either the Lere [1986] heuristic or the Dickhaut and Lere [1983] heuristic. There are two hypotheses associated with each heuristic approach. One null hypothesis is that each subject's vector of *final* prices, under the six experimental treatments, is equal to the vector of prices established using a particular heuristic in conjunction with the product-costing method chosen by the subject under each treatment. A second null hypothesis is that each subject *changed* the price on each iteration in the direction predicted by a particular heuristic.

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[11] Such simple calculations are consistent with the spirit of heuristic processes explored by Simon [1955], Baumol and Quandt [1964], Day [1967], and Anderson [1980]. Each subject had a calculator.

[12] In trials where either the demand function or the cost function was stochastic, one of the two possible functional forms was chosen randomly.

EXHIBIT 3

COSTING METHOD LEADING TO CLOSER APPROXIMATION OF COMPLETE-ANALYSIS PRODUCT PRICE

		Linear Cost Function (L)		*Nonlinear Cost Function* (NL)	
Demand (*Deterministic or Stochastic*)	*Cost* (*Deterministic or Stochastic*)	*DM Risk Neutral* (RN)	*DM Risk Averse* (RA)	*DM Risk Neutral* (RN)	*DM Risk Averse* (RA)
Deterministic (*D*)	Deterministic (*D*)	c_{11} *VC*	c_{12} *VC*	c_{13} *AC*	c_{14} *AC*
Deterministic (*D*)	Stochastic (*S*)	c_{21} *VC*	c_{22} *AC*	c_{23} *AC*	c_{24} *AC*
Stochastic (*S*)	Deterministic (*D*)	c_{31} *VC*	c_{32} *VC*	c_{33} *AC*	c_{34} *AC*

We also analyzed whether ten price-setting iterations were sufficient for subjects to converge to a product price. Data were compiled on the number of price-setting iterations actually used, and the sequence of price changes as subjects set tentative prices was analyzed. Finally, to address the question of whether learning took place during the experiment, data were compiled on the differences between the subjects' final prices and those predicted under the heuristic at various points during the sequence of trials.

Hypotheses About the Optimality of Prices

Apart from Lere's theory, one can ask to what extent subjects were able to choose the optimal price. To avoid the problems associated with measuring utility functions, we concentrated on the certainty conditions and/or the subjects whose elicited utility functions were perfectly (or nearly perfectly) linear. For these conditions and/or subjects, the optimizing behavior is expected-profit maximization. The null hypothesis is that subjects chose the expected-profit maximizing price.

Hypotheses About Product-Costing System Choice

Given Lere's heuristic price-setting method, the demand functions displayed in Exhibit 1 and the cost functions specified in equations (9) through (12), the DM will choose a price closer to the utility-maximizing price when using either *VC* or *AC* product-cost information as Exhibit 3 indicates.[13] Appendix B provides some indication of how the results are obtained.

We tested the subjects' tendency to select the product-costing system listed in Exhibit 3 under each of the experimental conditions. The null hypothesis is that subjects will select the method indicated in Exhibit 3.

RESULTS

Heuristic Price-Setting Procedure

A maintained hypothesis of Lere's [1986] theory of product-costing system choice is that the DM uses a price-setting heuristic such as the one characterized by equation (5). The descriptive validity of both the Lere heuristic and the Dickhaut and Lere heuristic was tested in two ways, as described below.

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[13] The hypotheses about product-costing system choice focus only on the Lere [1986] heuristic. The final prices predicted under the Dickhaut and Lere [1983] profit-based heuristic are the same under *VC* and *AC* because profit is the same. Hence, there would be no reason for the DM to select either of these product-costing systems over the other one under the Dickhaut and Lere heuristic.

First, we tested the null hypothesis that each subject's *final* price under each of the six experimental conditions is equal to the price established using the heuristic in conjunction with the product-costing method chosen by the subject under each experimental condition.[14] We computed the difference, under each of the six experimental conditions and for each subject, between the subject's final price and the price set according to the heuristic in conjunction with the product-costing system chosen by the subject under a given experimental condition. Table 1 displays the price that would be set under each experimental condition if either of the heuristic procedures were used in conjunction with *VC* or *AC*, and the optimal (profit-maximizing) price for a risk-neutral subject using the complete analysis. Also shown in Table 1 is the mean final price that was set on the trials under each of the 12 experimental situations (i.e., *DD/L/RN*, etc.) and under each of the product-costing system choices.

To determine whether the experimental condition had any impact on the differences between the subjects' prices and those predicted by the Lere heuristic, we conducted a three-way ANOVA, where the dependent variable was the price difference, and the three independent variables were {*DD*,*DS*,*SD*}, {*L*, *NL*}, and {*RN*,*RA*}. The only main or interaction effects that were statistically significant were the {*L*,*NL*} main effect ($F=20.74$, $df=1$, $p=.0001$) and the {*RN*,*RA*} main effect ($F=11.32$, $df=1$, $p=.0008$). As a result, the data were pooled across the three levels of the remaining independent variable {*DD*,*DS*, *SD*}, and four separate two-tailed *t*-tests were conducted to determine if the price difference was significantly different from zero under each of the following four conditions: *L/RN*, *L/RA*, *NL/RN*, and *NL/RA*. All four tests revealed statistically significant differences (at the .0001 level) between the subjects' final price and the price set according to Lere's heuristic procedure. Thus, the hypothesis that the subjects' final prices are equal to those predicted by the Lere heuristic is rejected.

An identical analysis of the price differences using the Dickhaut and Lere heuristic was conducted and the results were qualitatively the same. Thus, we also reject the null hypothesis that the subjects' final prices are equal to those predicted by the Dickhaut and Lere heuristic.

The second test of the heuristic price-setting procedures focused on the direction in which each subject changed the price on each iteration of the price-setting procedure. The null hypothesis is that each subject changed the price on each price-setting iteration in the direction predicted by the heuristic procedure. For each subject, the direction in which the price was changed on each price-setting iteration was recorded. This direction was compared with the direction of change predicted by each of the heuristic procedures, and each price change was classified as either consistent with a particular heuristic or inconsistent with that heuristic. Table 2 shows the proportion of price-setting iterations classified as consistent with each heuristic procedure under each of the experimental situations. In every case but one,

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[14] The six experimental conditions faced by each subject were *DD/L*, *DD/NL*, *DS/L*, *DS/NL*, *SD/L*, and *SD/NL*.

TABLE 1

PRICES PREDICTED UNDER HEURISTIC PROCEDURES, OPTIMAL PRICES UNDER COMPLETE ANALYSIS, AND MEAN FINAL PRICES SET BY SUBJECTS

			Linear Cost Function (L)				*Nonlinear Cost Function* (NL)			
Demand (Deterministic or Stochastic)	*Cost (Deterministic or Stochastic)*	*Product-Costing Method*	*Price Predicted Under Heuristic**	*Optimal Price***	*Mean Price in Risk Neutral Grp.* (RN)	*Mean Price in Risk Averse Grp.* (RA)	*Price Predicted Under Heuristic**	*Optimal Price***	*Mean Price in Risk Neutral Grp.* (RN)	*Mean Price in Risk Averse Grp.* (RA)
					c_{11}	c_{12}			c_{13}	c_{14}
Deterministic (*D*)	Deterministic (*D*)	*VC*	55.00	55.00	48.06	39.29	54.55	58.33	51.69	37.00
		AC	61.50		50.37	52.19	60.27		53.69	51.98
					c_{21}	c_{22}			c_{23}	c_{24}
Deterministic (*D*)	Stochastic (*S*)	*VC*	54.00	54.00	46.92	36.67	55.88	60.53	51.53	37.50
		AC	60.30		48.03	48.16	61.63		54.72	52.83
					c_{31}	c_{32}			c_{33}	c_{34}
Stochastic (*S*)	Deterministic (*D*)	*VC*	51.67	51.67	46.79	39.43	53.14	58.00	47.49	42.25
		AC	56.17		48.15	45.89	56.97		53.07	49.79

* The price set under either of the heuristic procedures does not depend on the DM's risk attitude. The price set under the Dickhaut and Lere heuristic is the same under both *VC* and *AC*, and is equal to the price given for the *VC* choice in the table. In the *DD/L* case, for example, the Lere heuristic predicts prices of 55.00 and 61.50 under the *VC* and *AC* choices, respectively. The Dickhaut and Lere heuristic predicts a price of 55.00 under either *VC* or *AC*.

** The optimal (profit-maximizing) price for a risk-neutral DM does not depend on the choice of *VC* or *AC*.

TABLE 2

PROPORTION OF PRICE-SETTING ITERATIONS CLASSIFIED AS CONSISTENT WITH EACH HEURISTIC PROCEDURE UNDER EACH EXPERIMENTAL SITUATION

		Linear Cost Function (L)		*Nonlinear Cost Function* (NL)	
Demand (Deterministic or Stochastic)	*Cost (Deterministic or Stochastic)*	*DM Risk Neutral* (RN)	*DM Risk Averse* (RA)	*DM Risk Neutral* (RN)	*DM Risk Averse* (RA)
Deterministic (*D*)	Deterministic (*D*)	c_{11} *VC*: .262 (.667)* *AC*: .561 (.661)	c_{12} *VC*: .333 (.625) *AC*: .543 (.694)	c_{13} *VC*: .356 (.720) *AC*: .449 (.717)	c_{14} *VC*: .500 (.400) *AC*: .373 (.688)
Deterministic (*D*)	Stochastic (*S*)	c_{21} *VC*: .403 (.671) *AC*: .578 (.662)	c_{22} *VC*: .167 (.500) *AC*: .519 (.826)	c_{23} *VC*: .370 (.653) *AC*: .413 (.755)	c_{24} *VC*: .211 (.533) *AC*: .402 (.681)
Stochastic (*S*)	Deterministic (*D*)	c_{31} *VC*: .399 (.697) *AC*: .390 (.705)	c_{32} *VC*: .212 (.609) *AC*: .411 (.683)	c_{33} *VC*: .395 (.633) *AC*: .379 (.772)	c_{34} *VC*: .435 (.706) *AC*: .356 (.654)

* In each cell, the first number is the proportion of iterations consistent with the Lere heuristic, and the number in parentheses is the proportion of iterations consistent with the Dickhaut and Lere heuristic.

the proportion of price changes consistent with the Lere heuristic is lower than the proportion consistent with the Dickhaut and Lere heuristic.

To determine whether the experimental condition had any impact on the consistency of the price-change direction with that predicted by each heuristic, a four-way ANOVA was conducted on the proportion of consistent price-change iterations with risk attitude $\{RN,RA\}$, type of trial $\{DD,DS,SD\}$, linearity $\{L,NL\}$, and product-costing method $\{VC,AC\}$ as explanatory variables. For the Lere heuristic, all four effects were significant at the .05 level or better. Thus, for each of the 24 conditions $\{(DD,L,RN,VC), (DD,L,RN,AC),\ldots, (SD,NL,RA,AC)\}$, the proportion of price changes that were consistent with the Lere heuristic were calculated. These proportions ranged from .0909 to .5930, with only four of them being greater than .5000. Of these four, only two were significantly different from .5000, while 17 out of the 20 proportions less than .5000 were significantly different from .5000 (binomial test, two-tailed, $p=.05$). We conclude from these tests that there is little evidence that the subjects tended to change the price in the direction predicted by Lere.[15]

Combining the results of tests on (1) the subjects' final prices, and (2) the direction of price changes, we conclude that there is only limited support for either of the heuristic price-setting procedures. Based on the price-change analysis, we conclude that there is greater support for the Dickhaut and Lere heuristic than for the Lere heuristic.[16]

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[15] An identical analysis was performed on iterations based on the Dickhaut and Lere heuristic. A four-way ANOVA (with the same explanatory variables) determines that product-costing method ($F=5.84$, $df=1$, $p=.0159$) was the only significant effect in determining the proportion of price-change iterations consistent with the Dickhaut and Lere heuristic procedure. Pooling across insignificant factors, the proportions are: *VC*, .6667; and *AC*, .7115. These are both significantly different from (greater than) .5000 (binomial test, $p<.0001$).

[16] An inspection of the subjects' notes, which were collected at the conclusion of the experiment, revealed

Observed Prices Versus Optimal Prices

The extent to which the subjects' prices conformed to the optimal (profit-maximizing) prices was also analyzed. Since it is not possible to specify with certainty the optimal (expected-utility-maximizing) price for a risk averse subject, we concentrated on either (1) the risk neutral subjects, or (2) the *DD* case with all of the subjects. (Under the *DD* condition, there is no difference in the optimal price between the *RN* and *RA* subjects.)

The difference between the subject's final price and the optimal price was computed for each *RN* subject under each experimental condition, and used in a three-way ANOVA on the price difference with the {*DD*,*DS*,*SD*}, {*L*,*NL*}, and {*VC*,*AC*} conditions as independent variables. Only the main effect for the product-costing method had a significant impact on the price difference ($F=9.88$, $df=1$, $p=.0018$). Two-tailed *t*-tests on the difference between the subjects' prices and the optimal prices for *VC* and *AC* were statistically significantly different from zero at the .0001 level. Thus, the data suggest that the risk neutral subjects did not set prices equal to the profit-maximizing prices.

A similar analysis was conducted using the data from all of the subjects but restricting the data to the *DD* case. Results were consistent with those reported above. Only the main effect for the product-costing method had a significant impact on the differences between the subjects' prices and the optimal prices, and the subjects' prices were statistically significantly different from the optimal prices under both the *VC* and the *AC* conditions.

We conclude that the *RN* subjects did not set prices equal to the optimal prices, nor did all of the subjects set prices equal to the optimal prices under the *DD* condition.

Sufficiency of Ten Price Setting Iterations

To see whether ten price-setting iterations were sufficient for subjects to converge to a price, we examined three indicators. First, we determined the number of trials in the entire experiment in which subjects used all ten possible price-setting iterations before setting a final price. In only 55 out of 756 trials (756 equals 63 subjects times 12 trials each), was the maximum number of ten iterations used. This represents only 7.28 percent of the trials. Second, we calculated the average number of price-setting iterations used by the subjects under each of the experimental conditions. These data are reported in Table 3, Panel A. The average number of iterations used, out of a possible ten, ranges from a minimum of 4.54, under the *DD/L/RN* condition, up to a maximum of 5.57, under the *DD/NL/RA* condition.

Third, we calculated the average absolute price differential, for all of the trials under each experimental condition, between the subject's final price and the last tentative price, between the last tentative price and the next to last tentative price, and so forth. The data are reported in Panel B of Table 3. The sequence of the average absolute price differentials among the last six prices can be seen by reading up the column within each experimental-condition cell. Thus, the sequence of price differentials for the *DD/L/RN* condition is (12.91, 10.47,

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that roughly 75 percent of the subjects made some attempt to keep track of profits. This could be viewed as anecdotal evidence in support of the Dickhaut and Lere heuristic.

TABLE 3

SELECTED DATA REGARDING SUBJECTS' PRICE-SETTING BEHAVIOR

Panel A: Average Number of Price-Setting Iterations Used

Experimental Condition	*DD/L*	*DD/NL*	*DS/L*	*DS/NL*	*SD/L*	*SD/NL*
RN	4.54	5.06	4.72	5.04	5.30	5.54
RA	5.07	5.57	5.54	5.04	4.93	5.46

Panel B: Average Absolute Price Differentials Between Successive Prices

Experimental Condition	*DD/L*	*DD/NL*	*DS/L*	*DS/NL*	*SD/L*	*SD/NL*
Differential Between Final Price and Last Tentative Price						
RN	2.96	3.72	3.93	3.50	3.70	2.46
RA	2.89	1.73	4.88	1.91	2.61	2.98
Differential Between *N*th and (*N*−1)st Tentative Price*						
RN	8.38	7.96	8.78	6.27	6.08	6.38
RA	12.29	8.02	13.31	7.87	12.83	10.19
Differential Between (*N*−1)st and (*N*−2)nd Tentative Price						
RN	8.21	10.12	10.04	6.91	6.26	7.02
RA	15.92	13.94	15.54	9.24	15.46	12.54
Differential Between (*N*−2)nd and (*N*−3)rd Tentative Price						
RN	9.90	10.39	9.37	9.40	7.71	8.90
RA	14.05	17.20	19.60	12.65	14.34	11.38
Differential Between (*N*−3)rd and (*N*−4)th Tentative Price						
RN	10.47	12.44	11.60	9.16	7.65	10.07
RA	13.94	11.68	16.06	14.75	13.62	12.53
Differential Between (*N*−4)th and (*N*−5)th Tentative Price						
RN	12.91	10.92	10.23	11.21	10.55	9.19
RA	12.09	11.46	15.82	17.67	9.50	12.58

* *N*th tentative price refers to last tentative price set by each subject.

9.90, 8.21, 8.38, 2.96). Examination of Table 2, Panel B, shows: (1) the average absolute price differential between the final price and the last tentative price, under each experimental condition, is relatively small, ranging from 1.73 to 4.88; (2) the sequences of price differentials are almost always decreasing. There are relatively few violations of monotonicity, and most of these are by small amounts. Moreover, in every case the last price differential (top set of data in Panel B) is strictly smaller than the next to last price differential (second set of data in Panel B). We conclude from the data in Table 3 and the fact that in only 7.28 percent of the trials did the subjects use all ten possible price-setting iterations, that ten iterations was sufficient for the subjects to converge to a final price.

Learning

To analyze whether the subjects appeared to learn the Lere heuristic during the course of the experiment, the difference between the price hypothesized under the heuristic and the subject's

TABLE 4

OBSERVED CHOICES OF ACCOUNTING PRODUCT-COSTING METHOD UNDER EXPERIMENTAL CONDITIONS

		Linear Cost Function (L)		*Nonlinear Cost Function* (NL)	
Demand (Deterministic or Stochastic)	*Cost (Deterministic or Stochastic)*	*DM Risk Neutral* (RN)	*DM Risk Averse* (RA)	*DM Risk Neutral* (RN)	*DM Risk Averse* (RA)
Deterministic (*D*)	Deterministic (*D*)	c_{11} •*VC*: 35 *AC*: 63	c_{12} •*VC*: 7 *AC*: 21	c_{13} *VC*: 53 •*AC*: 45	c_{14} *VC*: 2 •*AC*: 26
Deterministic (*D*)	Stochastic (*S*)	c_{21} •*VC*: 37 *AC*: 61	c_{22} *VC*: 3 •*AC*: 25	c_{23} *VC*: 38 •*AC*: 60	c_{24} *VC*: 4 •*AC*: 24
Stochastic (*S*)	Deterministic (*D*)	c_{31} •*VC*: 35 *AC*: 63	c_{32} •*VC*: 7 *AC*: 21	c_{33} *VC*: 36 •*AC*: 62	c_{34} *VC*: 4 •*AC*: 24

• Denotes the product-costing system that yields a price closest to the optimal price when used in conjunction with the heuristic price-setting procedure.

final price was averaged across the first four, middle four, and last four trials encountered by each subject. Then these three sets of price differences were averaged across subjects yielding 9.28, 7.79, and 6.02, respectively. Thus, the subjects exhibit a tendency to set prices closer to those predicted by the heuristic as they gained experience during the experiment. A similar analysis for the differences between the subjects' prices and the optimal price yielded 8.16, 6.21, and 4.71.

Product-Costing System Choice

Table 4 presents the number of choices of *VC* and *AC* under each of the experimental conditions. The asterisk in each cell indicates the product-costing system listed in Exhibit 3 as yielding a product price closer to the optimal price when used in conjunction with Lere's heuristic procedure. This data is used to examine the hypothesis that the subjects had a tendency to choose the product-costing system that yields a price closer to the optimal price.

Note that the data are consistent with the hypothesized choices in six cells (c_{14}, c_{22}, c_{23}, c_{24}, c_{33}, and c_{34}), but inconsistent with the hypothesized choices in the other six cells (c_{11}, c_{12}, c_{13}, c_{21}, c_{31}, and c_{32}). In all of the cells for which the data are consistent with the hypothesized choice, the hypothesized choice is *AC*. In all but cell c_{13} there is a very strong preference for *AC*. A casual inspection of the data suggests limited support for some of the hypothesized choices and a lack of support for others.

CATMOD (for Categorical Data Modeling) [SAS, 1985] was used to objectively analyze the data in Table 4. The CATMOD procedure modeled the response variable ($\{VC,AC\}$) as a linear function of several explanatory variables ($\{DD,DS,SD\}$, $\{L,NL\}$, and $\{RN,RA\}$). It was applied twice: (1) using a main-effects model, and (2) using a saturated model (i.e., with main effects and all binary and trinary interaction effects of the three explanatory variables).

Results of the main-effects model and saturated model were consistent. The only statistically significant main or interaction effect was the main effect for risk attitude ($x^2=29.61$, $df=1$, $p=.0001$ in the saturated model; $x^2=23.98$, $df=1$, $p=.0001$ in the main effects model). The risk attitude by linearity interaction effect was marginally significant ($x^2=3.34$, $df=1$, $p=.0678$) in the saturated model, and no other effects were close to significant.

The implication of the CATMOD analysis is that only the subjects' risk attitude played a significant explanatory role in their choices of the *VC* or *AC* product-costing system. This result can be seen by an inspection of Table 4. The proportion of *AC* choices is considerably higher in each of the *RA* cells than it is in any of the *RN* cells. Thus, the risk averse subjects were significantly more likely to choose *AC* than were the risk neutral subjects. This result is consistent with the theory tested, since the theory suggests that risk averse subjects may be more likely to choose absorption costing, and they will tend to use the difference between the *AC* and *VC* product costs as a surrogate for the risk premium implicit in the optimal product price. However, the result does not unequivocally support the theory, since the hypothesized choice is *VC* in two of the *RA* cells (c_{12} and c_{32}). Viewing this result in conjunction with the lack of a statistically significant effect for any of the other variables leads us to conclude that the theory of product-costing system choice we tested was only partially supported in this experiment.

In interpreting the results about product-costing system choice, one should bear in mind the potential impact of misclassifications of the subjects as risk neutral or risk averse. We have already pointed out that the utility-elicitation instrument used only hypothetical gambles. If, for example, this procedure resulted in a misclassification of some subjects as risk neutral, when they are really risk averse, this could explain the results in cells c_{21} and c_{31} of Table 4. In both of these cells, a majority of the subjects chose *AC*, even though *VC* was the hypothesized choice. If many or all of these subjects were really risk averse, then the hypothesized choice would have been *AC* (see cells c_{23} and c_{33} in Table 4), which would be consistent with the data. Such potential misclassification of the subjects introduces noise into the data. We found only partial support for the theory in the presence of such noise, but note that the support might have been even greater if we were able to perfectly classify subjects according to their risk attitude.[17]

Discussion and Conclusion

The results of this experiment partially support the theory developed by Lere [1986] and others to predict DMs' use of product-costing systems in setting prices. Both the CATMOD statistical procedure and the results in Table 4 reveal that the subjects' risk attitudes played a significant explanatory role in their choice of the variable or absorption product-costing system. A much larger proportion of the risk averse subjects chose the absorption product-costing system than did the risk neutral subjects. This finding is consistent with Lere's conjecture that the amount by which an absorption-costing product cost exceeds a variable-costing product cost could serve as a surrogate for a risk-premium component embedded in the optimal price for a risk averse DM. This phenomenon may have been present in the experiment. It is possible that we failed to characterize this phenomenon precisely because of the inability to perfectly classify subjects as risk averse and risk neutral.

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[17] Each subject faced each experimental condition twice. The proportion of trial pairs in which the subject chose the same product-costing method in both of the trials under each experimental condition is as follows: *DD/L*, .746; *DD/NL*, .730; *DS/L*, .778; *DS/NL*, .810; *SD/L*, .810; *SD/NL*, .810.

The overwhelming majority of product-costing system choices by the subjects (over 65 percent) were for absorption costing. Given the focus on marginal cost in economics courses and the intuitive conceptual similarity between marginal cost and variable cost, this is somewhat surprising.[18] This result is, however, consistent with evidence that managers in real-world firms rely overwhelmingly on absorption costing as the basis for their cost-based pricing policies [Gordon et al., 1981; and Govindarajan and Anthony, 1983]. This consistency between the experimental data and observed real-world practices lends some external validity to the task and experimental environment.

The heuristic procedure suggested by Lere [1986] for the price-setting procedure was not supported by the data from this experiment. The final prices set by subjects were significantly different than those predicted by either heuristic. The direction of subjects' price changes was not consistent with Lere's heuristic, but it was more consistent with the Dickhaut and Lere heuristic. The subjects' final prices were also significantly different than the optimal prices. We conclude, therefore, that neither of the heuristics or the complete analysis adequately describes the price-setting behavior of the subjects. It is possible that many different heuristics were used.

Some limitations could have affected our results. The most significant limitation is the imperfect technology for eliciting utility functions and the possible resulting misclassification of subjects as risk neutral or risk averse. Such potential misclassification did not affect the analysis of the subjects' conformity with the price-setting heuristic, since the prices set under the heuristic do not depend on the DM's risk attitude. However, such misclassifications could have affected the analysis of the subjects' choice of product-costing method. Risk-attitude misclassifications would introduce noise into the analysis.

This study was conducted in a relatively simple and abstract experimental setting. The generalizability of the findings is subject to the usual caveats associated with laboratory experiments. (See American Accounting Association [1972, pp. 455–471] for a discussion of these caveats.) A post-experimental questionnaire was administered to assess several attributes of the subjects' perceptions of the experiment. The subjects indicated that they understood the experimental task and the difference between variable and absorption costing very well. They also indicated that the task was interesting, realistic, and not particularly difficult.

Surveys of managers in real-world firms indicate that accounting product costs are heavily used in making pricing decisions despite the prescription of economic theory that marginal costs be used, and that firms tend to rely heavily on absorption costing rather than variable costing. Substantial theory and evidence suggests that decision makers in general tend to rely on heuristic approaches to decision making. Lere [1986] and others have developed a theory of heuristic price-setting behavior and product-costing system use that is rooted in economic theory and the theory of cognitive decision processes. The evidence obtained in this experiment only partially supports this theory.

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[18] It is possible that subjects have a bias toward the selection of *VC* as a result of economics courses that focus on marginal analysis. Such a bias is not apparent, however, in the results.

APPENDIX A

SUBJECTS' INSTRUCTIONS

Your task in this experiment is to determine the price at which you will sell your company's product. On each experimental trial you will face a different situation with respect to the demand for and the cost of your product. In some trials the demand function will be known to you (the deterministic case). On other trials you will know only that the demand function will be one of two equally likely functions, each of which will be known to you (the stochastic case).

These demand functions are shown on the chart in front of you. Please turn back the cover page of the chart to display this information. The top panel of the chart displays the demand function which will occur with certainty in those trials where you know the demand function. This demand function is presented in both graphical and algebraic forms. Also presented is the total revenue function (i.e., price times the demand function). The top panel of the chart also shows you the rate of change, with respect to price, of the total revenue function (i.e., the derivative of the total revenue function with respect to price). Please pause now and study the top panel of the chart for a few minutes until you are sure that you understand the information presented.

The bottom panel of the chart presents the same information for the two equally likely demand functions which can occur in those trials where there is uncertainty about demand. Please pause for a few minutes to study the bottom panel of the chart.

On each trial there will also be a cost function which will determine the cost of producing a given quantity of your product. The cost function has a fixed-cost component and a variable-cost component. The total fixed cost does not change with respect to changes in quantity produced, while the total variable cost does. On some trials the variable-cost component will be linear, so there will be constant marginal increments in variable cost with respect to changes in the quantity produced. On other trials the variable-cost component will be nonlinear, and so variable cost will exhibit increasing marginal increments with respect to changes in quantity produced. Moreover, on some trials there will be only one possible cost function which can occur (the deterministic case), while on other trials there will be several possible cost functions which can occur probabilistically (the stochastic case). There will be no relationships among the cost functions which occur on different trials.

On a given experimental trial, you will not know anything about the cost function except that it is either linear or nonlinear, and that it is either deterministic or stochastic. The only way you can get additional information about the cost function is to ask for a cost-accounting report. When you ask for a cost-accounting report, the computer will ask you to suggest a price for the product. The computer will then determine the product demand in accordance with the demand function for that particular trial. If demand is uncertain, the computer will determine the expected demand given your suggested price. Then the computer will give you the cost-accounting report based on that level of product demand.

On each trial you may specify either of two types of cost-accounting report: variable costing or absorption costing. If you choose a variable-costing report, the computer will report to you a unit cost figure which is the total variable cost, at the given level of demand, divided by the number of units demanded. If you choose an absorption-costing report, the computer will report to you a unit cost figure which is the total cost (fixed and variable), at the given level of demand, divided by the number of units demanded.

In both types of costing reports, on trials when the variable-cost component of the cost function is stochastic, the computer will use the expected value of cost instead of actual cost in computing the unit cost figure to be reported. Moreover, in both types of cost-accounting reports, on trials when demand is stochastic, the computer will use the expected value of demand, instead of actual demand, in computing the unit cost figure to be reported. On no trial will both demand and cost be stochastic. Either one or both of demand and cost will be deterministic on every trial.

Each trial will proceed as follows. First, the computer will let you know whether demand is deterministic or stochastic. You can then refer to the chart to refresh your memory regarding the demand functions. Second, the computer will inform you as to whether the cost function is deterministic or stochastic, and whether its variable component is linear or nonlinear. Then you will select the type of cost-accounting report you wish to receive throughout the trial. You will then have up to ten opportunities to set a tentative price for the product. Each time you tentatively set the price, the computer will determine the demand (or expected demand). If you wish, given this demand level, the computer will provide you with a cost-accounting report of the type you selected at the beginning of the trial. Based on your knowledge of the demand function and the cost-accounting report, you can either try another tentative price, or fix the price permanently at a particular level. The final price can be any of your tentative prices, including the most recently set price, or even one (within the proper range of values) for which you have no cost or demand information.

Once you determine the final price, the computer will use that price to determine demand and total revenue in accordance with the demand function for that particular trial. Given the realized level of demand, the computer will determine total cost in accordance with the cost function for that particular trial. The net profit (total revenue minus total cost) will be reported to you, as well as cumulative profit for all trials you have encountered up to that point.

The experiment will consist of several trials. Your payment for participating will be a fixed percentage of your total profits across all of the trials. Hence, you can maximize your payment by attempting to set a price which will maximize your profit on each trial. Everyone will be paid at least five dollars.

The remainder of the session will proceed as follows. First, you will be asked several multiple choice questions to make sure that you understand the instructions you have just read. Second, you will have an opportunity to perform the pricing task on a practice trial. For this one trial, you will be allowed to change the price as many times as you wish. Also, any profits from this trial will not be included in determining your payment. Third, you will perform the actual experimental trials. Note that each time you select a price, the demand and cost information you receive can not be accessed at a later time. Therefore, you may want to use the paper and pencil provided to make some comments or notes about the results for future reference. Finally, you will answer some other questions germane to this study.

APPENDIX B

COSTING METHOD LEADING TO CLOSER APPROXIMATION OF COMPLETE-ANALYSIS PRODUCT PRICE

Let c_{ij} denote the cell in the *i*th row and *j*th column in Exhibit 3. Consider the top row of Exhibit 3. When both demand and cost are deterministic, the risk attitude of the DM is irrelevant. Hence, we would expect that the product-costing system leading to a closer approximation of the complete-analysis price would be the same under the *DD/L/RN* and *DD/L/RA* conditions (c_{11} and c_{12}), and also the same under the *DD/NL/RN* and *DD/NL/RA* conditions (c_{13} and c_{14}). In the case of a linear cost function, a *VC* accounting system used in conjunction with Lere's price-setting heuristic yields the same product price as the complete analysis. This can be seen by performing the complete analysis and the heuristic procedure. When the cost function is linear, the product cost computed under *VC* is identical to the marginal cost at all levels of q. With the cost function used in our experiment, the marginal cost and *VC* product cost are equal to 10 at all levels of q. The optimal (complete analysis) price, denoted p^*, is equal to 55, which is in turn equal to the price set using the heuristic in conjunction with *VC*, denoted p_v. Thus, the product-costing method yielding a closer approximation to the complete-analysis price under the *DD/L/RN* and *DD/L/RA* conditions (c_{11} and c_{12}) is *VC*, as indicated in Exhibit 3.

Now consider the case of a nonlinear cost function. As Lere [1986] shows, when the cost function exhibits increasing marginal costs, the complete-analysis product price, p^*, will exceed that chosen when *VC* is used in conjunction with the heuristic, p_v. This is true because the marginal cost exceeds the *VC* product cost at all levels of q. It is also true that the heuristic used in conjunction with *AC* yields a higher product price, denoted p_a, than does the heuristic used in conjunction with *VC*. This results from the fact that the *AC* product cost will exceed the *VC* product cost at all levels of q. Lere [1986] shows that when the cost function exhibits increasing marginal cost, there exists an output level above which p_a will be closer than p_v to p^*, when the product price is set using the heuristic. With the cost function used in our experiment, under both *DD/NL* conditions, p^* is 58.33, which yields a profit of 1583.33. In comparison, p_v is 54.55 (yielding a profit of 1566.16), and p_a is 60.27 (yielding a profit of 1578.86). Thus, under the *DD/NL/RN* and *DD/NL/RA* conditions (c_{13} and c_{14}), the product-costing method shown in Exhibit 3 is *AC*, since the profit is closer to the maximal (complete analysis) profit level when p_a is specified.

As Leland [1972] and Lere [1986] show, when either demand or cost is stochastic, but the DM is risk neutral, the price analysis is the same as it is under certainty. Thus, when the cost function is linear, the *VC* product cost is equal to the marginal cost at all levels of q, and $p^*=p_v \neq p_a$. With the demand and cost functions we used in our experiment, under the *DS/L/RN* condition, $p^*=p_v=54$, and under the *SD/L/RN* condition, $p^*=p_v=51.67$. Thus, under these two conditions (c_{21} and c_{31}), Exhibit 3 shows *VC* as the product-costing method yielding a closer approximation to the complete-analysis price.

Next, consider the cases where the cost function is nonlinear, the DM is risk neutral, and either cost or demand is stochastic: conditions *DS/NL/RN* and *SD/NL/RN* (c_{23} and c_{33}). The risk neutrality of the DM means that the analysis is effectively the same as the *DD/NL* condition. Under all three conditions, with the demand and cost functions used in our experiment, both the marginal cost and the *AC* product cost are greater than the *VC* product cost. The result is that under all three conditions, p_a is closer to p^* than is p_v, and p_a yields a higher expected profit than p_v. Under the *DS/NL/RN* condition, p^* is 60.53 with $E(\pi)$ equal to 1473.57, while p_v is 55.88 with $E(\pi)$ equal to 1446.42, and p_a is 61.63 with $E(\pi)$ equal to 1472.14. Under the *SD/NL/RN* condition, p^* is 58 with $E(\pi)$ equal to 1988, while p_v is 53.14 with $E(\pi)$ equal to 1941, and p_a is 56.97 with $E(\pi)$ equal to 1986. Thus, *AC* is the product-costing method shown in Exhibit 3 under these two conditions.

The four cases remaining in Exhibit 3 are those in which the DM is risk averse and either demand or cost is stochastic: conditions *DS/L/RA* (c_{22}), *DS/NL/RA* (c_{24}), *SD/L/RA* (c_{32}), and *SD/NL/RA* (c_{34}). Here the analysis is considerably less straightforward since in these cases, the complete analysis requires knowledge of the DM's utility function [see equation (4)]. In contrast to the demand and cost functions, which can be specified in the experiment, the subjects' utility functions can neither be specified nor perfectly observed. We attempted to elicit the subjects' utility functions for the purpose of classifying the subjects as risk neutral or risk averse. However, there is certainly measurement error in these elicited functions. This presents a problem in determining the complete analysis product price, p^*, and consequently in determining whether *VC* or *AC*, used with Lere's heuristic, yields a price closer to p^*.

Our approach in these four cases was to assume a particular class of utility functions (the power utility function, $u(x)=x^\gamma$), and determine for that class of functions whether p_a or p_v yields a higher expected utility for risk averse DMs, whose utility functions are characterized by the class of power utility functions. In those cases where $p_v(p_a)$ yields a higher expected utility for risk averse individuals with power utility functions, Exhibit 3 shows *VC*(*AC*) for those subjects classified as risk averse. As Exhibit 3 indicates, risk averse subjects will come closer to the expected utility-maximizing price using *AC* under conditions *DS/L/RA* (c_{22}), *DS/NL/RA* (c_{24}), and *SD/NL/RA* (c_{34}), and using *VC* under condition *SD/L/RA* (c_{32}).

Lere [1986] provides some insight into why the heuristic used in conjunction with *AC* may (for some demand, cost, and utility functions) yield a higher expected profit than *VC* used with the heuristic. There are two potential reasons. As noted above, when the cost function exhibits increasing marginal increments, both p^* and p_a are above p_v. The fixed-cost component included in the *AC* product cost helps to bring the *AC* product cost more in line with the marginal cost than the *VC* product cost, when marginal cost is increasing in q. However, there is also another reason that *AC* can, under some circumstances, provide a higher expected utility than *VC* when the DM is risk averse and either demand or cost is stochastic. The heuristic price-setting procedure does not account for the DM's risk attitude, whereas the complete analysis does. As Lere [1986] and Leland [1972] discuss, there is a risk-premium component in p^* when the DM is risk averse and faces uncertainty. Lere shows that the amount by which p_a exceeds p_v (because the *AC* product cost exceeds the *VC* product cost) can act as a surrogate for the risk-premium component in p^*.

To further clarify the procedure we used to choose the *VC* or *AC* entry in Exhibit 3 under the four conditions where the DM is risk averse and faces uncertainty, we show the calculations for the *DS/NL/RA* condition (c_{24} in Exhibit 3). For a DM with the power utility function, $u(x)=x^\gamma$, the values of p^*, for various values of γ, are as follows:

γ	*.01*	*.05*	*.1*	*.2*	*.3*	*.4*	*.5*	*.6*	*.7*	*.8*	*.9*	*1.0*
p^*	60.67	60.66	60.66	60.64	60.63	60.61	60.60	60.58	60.57	60.56	60.54	60.53

In contrast, p_v is 55.88 and p_a is 61.63. Thus, p_a is closer to p^* at all values of γ than is p_v. Moreover, p_a yields a higher expected utility than p_v for risk averse individuals. For example, the expected utility for γ equal to .05 is 1.4399 under p_a but 1.4386 under p_v.

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Municipal Audit Fee Determinants

Marc A. Rubin

ABSTRACT: Prior audit fee studies have examined the private sector audit market. This research extends prior research by developing a model of audit fees for municipalities. Many of the determinants used in this model are based on (or extensions of) determinants used in private sector audit fee models. Empirical tests using regression analysis indicate a significant portion of the variance in municipal audit fees is explained by the model. Using a framework adopted from Simunic [1980] for analyzing private sector audit markets, statistical results suggest that the municipal audit market is competitive.

THE *Commission on Auditors' Responsibilities* [Commission on Auditors' Responsibilities, 1978] has suggested the existence of a relation between audit fees and audit performance.[1] In conjunction with and subsequent to the Commission's report, several studies have investigated audit firm pricing practices, audit quality, competitiveness of the audit industry, and audit costs [Elliott and Korpi, 1978; Simunic, 1980; Francis, 1984; Francis and Stokes, 1986; and Palmrose, 1986]. These studies utilized data solely from the private sector and, therefore, their results provide evidence about audit pricing only in that sector of the economy.

Similar to private sector firms, many local governments contract with independent auditors to perform financial statement audits.[2] But the public sector may differ from the private sector in both the environment and procedures surrounding the audit contracting process. For example, the accounting systems and types of financial reports associated with governmental units are substantially different from those found in the private sector. Also, the financial statement users vary significantly between the two sectors, thereby creating audit risks that may differ from audits of private industry. In addition, contracting procedures for audits in state and

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[1] For example, *The Commission on Auditors' Responsibilities* stated the following:

> If the effective purchasers of the auditor's services are more conscious of price than quality, auditors will be tempted to compete on the basis of price and to make necessary adjustments in the extent of work performed. [The Commission on Auditors' Responsibilities, 1978, p. 112]

[2] The *Code of Federal Regulations* [1983] describes the audit requirements for municipalities receiving federal revenue sharing funds. In addition to the federal requirements, many states also require municipal audits. *Surveying the States* [MFOA, 1983] reviews state requirements. The survey indicates that approximately 80 percent of the states require or allow independent CPA firms to perform the audits.

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Marc A. Rubin, University of North Carolina at Chapel Hill.

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local governments may be regulated by statute.

The purpose of this paper is to provide evidence on the determinants of audit fees paid by municipalities to their external auditors. Building on previous private sector audit fee studies, evidence is obtained relating to the market structure and pricing practices of CPA firms with respect to municipalities.

The next section of this paper presents a brief review of the previous audit fee research. A description of the model of audit fees paid by a municipality to its independent auditor is in the second section and the third section describes the sample. The fourth section presents results and the fifth section contains a discussion of results. A summary with concluding comments are contained in the last section.

I. PREVIOUS AUDIT FEE RESEARCH

Simunic [1980] provides an economic analysis of competition within the market for audit services. The objective of his research is to provide evidence on the competitiveness of the "large" auditee market. In order to assess the competitiveness of this market, Simunic assumes that "small" auditees purchase audit services in a competitive market. To provide the necessary empirical evidence on audit market competition, Simunic analyzes audit fees by developing a model which controls for factors affecting audit quantity and price. These factors relate to the complexity and risk of the auditee and learning by the auditor. After regressing audit fees on the selected set of explanatory variables for samples of large and small auditees, Simunic compares the regression coefficients (both significance and sign) of the variable indicating a Big Eight auditor between the samples.

Simunic's results generally indicate that measures of auditee complexity and risk are associated with audit fees. Further, his results suggest that large audit firms (the Big Eight) are not significantly associated with higher audit fees in either the large or small auditee market. An exception to this result is the finding that one firm, Price Waterhouse, had a positive and significant coefficient. Simunic interprets his empirical results as support for the existence of competitive audit markets.

Several other studies have addressed the question of audit fee determinants and competition in the audit market. Francis [1984] and Francis and Stokes [1986] both replicate the Simunic study using data from Australian companies. Palmrose [1986], in a study examining audit quality, also examines fee determinants and the relation of auditor size and audit fee in American companies. Francis and Simon [1987] examine the association between auditor size and audit fees in small U.S. corporations.

The results in all of these private sector audit fee studies suggest, using the Simunic [1980] framework, that audit markets are competitive. In addition to the results regarding the competitiveness of audit markets, audit fee studies have provided evidence regarding a variety of auditor and auditee characteristics which are associated with fees. These characteristics are most often related to auditee size, auditee complexity, or auditor risk. Specific results from previous audit fee studies concerning these variables are included in the discussion of the municipal audit fee model in the following section.

II. MUNICIPAL AUDIT FEE MODEL

Since audit outputs are not readily observed and audit services are somewhat unique to each organization, it is difficult to discern exactly how a particular characteristic affects the final audit fee. That is, a specific aspect of the audit environment may affect either the number of units of auditing required to provide an opinion, the cost per unit of providing the audit services, or both simultaneously. Therefore, the municipal audit fee model is based upon those factors suggested in prior research as having an affect on the total audit fee.

Although some variables used in previous models can be appropriately used in the municipal fee model, new variables are also necessary to capture the unique aspects of the municipal government environment. The variables used in the municipal fee model are classified into the following categories; auditee size, loss exposure, entity complexity, report complexity, auditor retention and selection, audit production costs, and auditor size. Each of these factors are defined and discussed below along with the source of the measurement of the factor.

Auditee Size

Audits entail a review of the financial transactions of the organization. Larger organizations usually enter into more financial transactions thereby requiring more audit time. Therefore, size should be associated with higher audit fees. In most of the previous private sector audit fee studies size is measured by either revenues or assets of the firm. Municipalities often prepare financial information in ways which do not easily allow comparisons between them. Therefore, a financial measure of size may contain relatively more noise than an alternative size measure such as population. Using population as a measure for size is consistent with previous municipal research [Borcherding and Deacon, 1972]. Since the increase in fees is likely to be less than linearly related to population, a natural log transformation of population is used.[3]

Loss Exposure

Audits vary as to the auditor's risk of loss from lawsuits. Audit fees are likely set to compensate for differences in loss exposure. Previous audit fee models use either selected financial ratios [Simunic, 1980 and Francis, 1984] or an indication as to whether the company was publicly held [Palmrose, 1986] to control for the likelihood of significant auditor losses. In the municipal environment, an appropriate measure of risk of loss is the amount of debt a municipality has incurred. That is, a city that incurs relatively greater amounts of debt (controlling for size) is likely to be in a more risky financial condition, thereby exposing the auditor to greater expected losses. A natural log transformation of debt per capita is used as the measure of loss exposure. Debt is measured as total debt (general obligation, revenue, and short-term) for the municipality.

In addition to per capita debt, the bond rating of the debt also reflects the financial viability of a municipality and is used as an explanatory variable. Bond rating is defined as the city's general obligation (GO) bond rating as reported by Moody's Investor Service. Lower bond ratings are expected to be associated with higher audit fees. An important distinction in municipal bond ratings is whether the bond is rated as investment or noninvestment grade. Regulation restricts some investors from investing in noninvestment grade bonds. Noninvestment grade bonds are often considered to be a Baa rating or below.[4]

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[3] A similar transformation is used in the audit fee models of Francis [1984] and Palmrose [1986].

[4] Kaufman [1981] states, "That some investors (e.g., commercial banks) are restricted by law, or by regula-

For the municipal audit fee model, the noninvestment grade bonds are used as an indicator of significant financial weakness and bond ratings are dichotomized with those cities with a Baa rating or below in one group and those above Baa in the other.[5]

Some municipalities do not have a general obligation bond rating. For purposes of this research, cities with no GO bond rating but with per capita debt greater than the mean for the sample are coded as noninvestment grade bonds; otherwise, cities with no GO bond rating were coded as investment grade bonds. This coding is based on Reeve and Herring's [1986] finding that smaller nonrated bond issues had lower interest costs than the lowest investment grade bond class, whereas for larger nonrated bond issues, interest costs were higher than the lowest investment grade class.[6]

Entity Complexity

More complex organizations require additional audit time because of coordination costs and increased variety of transactions and internal control systems that the auditor may need to study and evaluate. Previous measures of complexity include the number of industries in which a company participates, the number of consolidated subsidiaries, the composition of assets [Simunic, 1980], and the number of different company locations requiring auditor visits [Palmrose, 1986].

In the municipal audit fee model, organization complexity is measured by the number of different services a city provides beyond the basic services of police, fire, and general administration. The service index reflects the number of non-ordinary services a city offered to its constituents including education, library, health care, correctional facilities, utilities, welfare, and housing. Each of the non-ordinary services is assumed to have an equal effect on audit fees. A positive association is expected between the index and audit fees. The index is constructed by information provided by a survey questionnaire sent to a sample of municipalities as described in section III. The questionnaire asked the respondent to provide data on the city's activities that are included in the audited financial statements. Since public safety and general administration activities are assumed to be provided by all cities, the index is a count of activities that are not uniformly provided by all municipal governments.

Report Complexity

Audit engagements may differ as to the presentation and scope of information being attested to in the audit opinion. The greater the number of audit reports required by the auditee the more likely audit costs will rise. In addition, financial reports with greater amounts of data will likely increase auditor time. Previous audit fee models include the number of separate audit reports provided as a measure of audit report complexity [Elliott and Korpi, 1978 and Palmrose, 1986]. The municipal audit fee model also uses the number of separate audit reports as a measure of reporting complexity. In order to linearize the

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tions, from purchasing lower quality securities, often considered those rated Baa or below," (p. 314). This view is also supported by Horton [1970].

[5] A variety of classifications of bond ratings were substituted in the regression model. The other classifications have no effect on the significance of the remaining variables and generally have little effect on the total explanatory power of the model.

[6] To make sure that the coding for nonrated bonds did not affect results, the regression model was estimated excluding the municipalities without a bond rating. Twenty-three cities in the sample had no GO bond rating. Regression estimates are not significantly different from those reported here with removal of these observations.

relation of number of reports to audit fee, the natural log of the number of reports is used. A positive association is expected between audit reports and audit fees. The number of audit reports was obtained from the survey questionnaire.

Municipalities prepare either one of two forms of financial reports. One form of financial report is the General Purpose Financial Statement (*GPFS*) and the other is the Comprehensive Annual Financial Report (*CAFR*). The *CAFR* contains all the information included in the *GPFS* plus considerable additional financial and demographic information about the city. Since the *CAFR* is a more detailed report it is considered the more complex. Therefore, the municipal audit fee model uses an indicator variable for whether the report is a *CAFR*. *CAFR* is expected to yield higher fees. The information regarding the type of report was obtained from the survey.

A third measure of report complexity is audit opinion modifications. Prior audit fee models use audit opinion modifications to indicate the division of potential loss sharing between auditor and client [Simunic, 1980] or a change in audit procedures [Palmrose, 1986]. In the prior audit fee models, a modified opinion was hypothesized to be associated with higher audit fees because it was expected to increase the risk, the number of performed audit procedures, or both. Although previous studies suggest a positive relation between audit fees and modified opinions, a counter argument can be made that modified opinions reduce the auditor's risk because of the warning provided by the modified opinion to the financial statement user. Modified audit opinions (qualified, adverse, or disclaimer) are used in the municipal audit fee model but no prediction is made regarding the expected sign. Information regarding opinion type was obtained from a survey and verified, where possible, by reference to the audit report.

Auditor Retention and Selection

Audit fees appear to be potentially susceptible to both learning curve and costly contracting effects. Simunic [1980] suggests that over time auditors may increase their efficiency in auditing a particular client. He predicts that the cost savings from auditor learning are passed to the auditee. Simunic's empirical results do not provide support for the expected negative association of audit fees and auditor tenure.

DeAngelo [1981] suggests a competing hypothesis which may account for Simunic's results. DeAngelo hypothesizes that audit fees may initially be low and then increase because of costly contracting. She asserts that costly contracting (to the auditee) allows auditors to collect quasi-rents in audit fees subsequent to the initial year of an audit and given this ability auditors may "low ball" to obtain the initial audit engagement. Following DeAngelo's argument, audit fees may be expected to increase with auditor tenure unless the auditee can capture any benefits of auditor learning and avoid the payment of quasi-rents by threatening to change auditors.

The following is an attempt to separate the auditor tenure effect for those municipalities that regularly receive bids on their audit and, thus, threaten to change auditors, from those cities which do not. Two variables are used. The first is the current auditor's tenure time (a maximum of 15 years is imposed because of data availability) if the city regularly solicits bids for its audit or zero if a city does not regularly solicit audit bids. This variable is expected to be negatively associated with auditor fees since the longer the auditor's tenure, the greater the potential effect of learning and potential to pass savings to the auditee. The second variable is the auditor's tenure time (maximum of 15 years) for those cities which *do not* regularly solicit bids or zero for those cities which regularly solicit audit bids. This variable is expected to have a positive association with audit fees since it is more likely quasi-rents are being charged to the auditee. By using two variables to ascertain the effect of auditor tenure on audit fee, additional evidence is provided concerning both Simunic's and DeAngelo's expectations. If auditor tenure is positively related to audit fees in both cities that regularly and irregularly receive audit bids, then the evidence supports DeAngelo's hypothesis. If auditor tenure is negatively related to audit fees in both cases, then the evidence supports Simunic's hypothesis. If the auditor tenure variable with regular bids has a negative coefficient and the auditor tenure variable without regular bids has a positive coefficient, then the evidence supports both DeAngelo's and Simunic's hypotheses, but under the additional condition of whether bids are regularly solicited. Information on auditor tenure and bid solicitation practices were obtained from survey questions.

Audit Production Costs

Two variables related to additional characteristics of the audit environment are expected to affect audit fees.[7] One is the timing of audit procedures and the other is the retention time of the auditee's chief financial officer.

Historically, private sector audits procedures have been concentrated from the period of November through March. Audits performed during this "busy season" are thought to be more costly because of the greater demand for auditors during the period [Palmrose, 1986 and Francis, 1984]. Thus, audit fees are expected to be systematically higher for "busy season" audits and less for those performed in the remaining months of the year. In the municipal audit fee model, an indicator variable reflects whether the audit is performed during the period from November through March. Timing of audit procedures was obtained from a survey question.

Audit efficiency depends on the continuity and consistency of efforts by both the auditor and the client. If changes frequently occur in auditee personnel, then the auditor will likely incur additional costs. It is expected that recent changes in auditee personnel are associated with higher audit costs. The municipal audit fee model includes a proxy variable for client personnel changes. It is the retention time of the auditee's chief financial officer (15 years is the maximum because of data availability). The retention time of the chief finance officer was obtained by examining the directory of municipal officials included in the relevant volumes of *The Municipal Year Book.*

Auditor Size

As previously discussed, the expected relation between auditor size and audit fees depends on the competitive nature of the audit market. In order to assess the fee/auditor size relation, a framework similar to Simunic [1980] is used. Simunic assumes that the audit market for small auditees is competitive. If his assumption is accepted, then by comparing the effect of auditor size on audit fees between the large and small auditee markets, the competitive nature of the large auditee market can be inferred. Auditor size is measured by whether a firm is one of the Big Eight. For example, if for both small and large auditees, Big Eight firms are found to be associated with significantly higher audit fees, then the large auditee market also is competitive with Big Eight product differentiation.[8]

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[7] A third audit production variable, significance of internal audit usage, was also included in the regression model. This variable is not significant in any version of the model. The insignificance may be due in part because of the difficulty in obtaining reliable data concerning the role of internal auditors in municipal audits.

A similar analysis can be performed for municipalities. It is assumed that small municipalities contract for audits in a competitive market. Therefore, the municipal audit fee model contains three indicator variables capturing the joint effects of auditor size and municipality size. Auditor size is measured by whether a firm is Big Eight. Municipalities are categorized as being large or small based on whether they are above or below the median population of the sample. The model uses small cities that do not use Big Eight auditors as the basis for comparison and includes an indicator variable for small cities using a Big Eight auditor, an indicator variable for large cities not using a Big Eight auditor, and an indicator variable for large cities using a Big Eight auditor. Evidence on market competition in large cities is based on the coefficients of the joint effect indicator variables. The large city audit market is considered non-competitive (monopolistic) if the variable indicating large city Big Eight audits is positive and the other indicator variables have insignificant or negative coefficients. The large city audit market also is considered non-competitive if the large city Big Eight indicator variable coefficient is insignificant but the small city Big Eight variable is negative. Remaining combinations of signs of the indicator variable coefficients suggest competitive markets. Information regarding auditor identification was obtained from the survey.

Dependent Variable

Following Francis [1984] and Palmrose [1986], the dependent variable for the model is the natural log of the municipality's audit fee. Data on city audit fees were obtained from the survey. Table 1 summarizes the variables used in the municipal audit fee model, the coding of indicator variables, the expected relation between the independent and dependent variables, and the data sources.

III. SAMPLE

The municipal audit fee model is tested with data from the fiscal year 1982. A single year was selected to simplify data collection and to avoid changes in either market conditions or federal regulation (e.g., the requirement for single audits of federal fund recipients). Most sizable cities were required to be audited by either state or federal statute.

Data for testing the municipal audit fee model were obtained from either public sources or a survey questionnaire. The population of cities from which a sample is drawn is comprised of those listed in *City Government Finances* [United States Department of Commerce, 1983]. *City Government Finances* includes only cities which have a population over 50,000 as measured by the 1980 U.S. census. This minimum population criteria provides a sample of 449 cities. The survey questionnaire was sent to the 449 identified cities and then those not audited by independent certified public accountants were eliminated.

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[8] A complete analysis of the various scenarios of audit pricing is contained in both Simunic [1980] and Francis and Stokes [1986].

TABLE 1

SUMMARY OF PROPOSED AUDIT FEE DETERMINANTS, MEASURES USED, EXPECTED RELATION TO AUDIT FEE, AND INFORMATION SOURCES

Audit Fee Determinant	*Measure*	*Abbreviation*	*Expected Relation to Audit Fees*	*Information Source*
Auditee Size	Population (log)	$\ell n(POP)$	+	1980 census
Loss exposure	Debt per capita (log)	$\ell n(DEBT)$	+	City Government 1982 census
Loss exposure	General obligation Bond Rating (1 = noninvestment grade)	*RATING*	+	Moody's 1982 GO rating
Entity complexity	Service Index	*INDEX*	+	Survey
Report complexity	Number of Reports (log)	$\ell n(REP)$	+	Survey
Report complexity	*CAFR* (1 = *CAFR*)[1]	*CAFR*	+	Survey
Report complexity	Opinion modification (1 = modified)	*MOD*	unknown	Survey
Auditor selection	Auditor tenure—Bid Cities	*TENBID*	–	Survey
Auditor selection	Auditor tenure—Non-Bid Cities	*TENNOBID*	+	Survey
Audit production	Busy Season Audit (1 = Nov.–March)	*BUSY*	+	Survey
Audit production	Finance Officer Tenure	*FOTEN*	–	Municipal Year Book
Auditor and city size interaction	Small City/Big Eight	*SB8*	unknown	Survey
Auditor and city size interaction	Large City/Non-Big Eight	*LNB8*	unknown	Survey
Auditor and city size interaction	Large City/Big Eight	*LB8*	unknown	Survey

[1] *CAFR* denotes Comprehensive Annual Financial Report

The sample was further reduced to include only those cities that had been audited for a minimum of eight consecutive years up to and including 1982. The eight year requirement was used as a minimum amount of time to determine whether the municipality regularly sought audit bids. The identification of the auditor and the length of time the city has been audited could not be determined except by use of the survey.

Questionnaires were mailed to the 449 cities and responses were received from 272 or 60.6 percent. Of these responses, 46 were not usable since they did not meet eligibility requirements (i.e., they were not audited by external auditors for eight years) and 37 had significant missing information (primarily data relating to the city's audit fee). Therefore, 189 responses (42 percent of the original sample) were used in the statistical tests. None of the usable responses were from cities over one million population (six U.S. cities have populations over one million) so that the results may apply only to cities with population between 50,000 and 1,000,000.

The survey responses were in part verified by examining available financial reports or municipal expenditure census data. Potential response bias was examined by comparing publicly available (census and bond rating) information of responding versus non-responding cities as well as comparing early versus late respondents. Information was available pertaining to population, debt, revenue, and bond ratings. In addition, specific items which were not responded to were examined in the returned questionnaires. The only indication of response bias was that responding cities have a significantly better general obligation bond rating than non-responding cities. This bias may affect results by causing a less accurate coefficient estimate of the bond rating variable. In addition, the regression model may not fit as well to those cities with lower bond ratings.

IV. Results

A regression of the log of the municipality's audit fee on the explanatory variables (fee determinants) provides the primary evidence on the descriptive validity of the fee model. Regressions were based on the total sample (189 cities) as well as on subsamples of large and small cities. The subsample regressions were estimated to determine whether the regression model coefficients differ across city size. Since existing theory does not suggest how to differentiate cities regarding the audit contracting environment, large and small cities were defined as the top third and the bottom third of the cities in the sample ranked by population. By eliminating the second third of cities in the sample, misclassification of a city regarding its proper size group is less likely.

Descriptive statistics for the explanatory variables are presented in Tables 2 and 3. Table 2 shows that large cities, as expected, were associated with higher audit fees. In addition, large cities, on average, had higher per capita debt, offered more services and more often used a Big Eight firm. In assessing differences between cities which use Big Eight versus non-Big Eight firms (Table 3), Big Eight firm cities were larger, had more debt, offer more services and retained their auditor for shorter periods.

Results of regressing *ln* (audit fees) on the audit fee determinants are summarized in Table 4. A variety of formulations of the regression model were analyzed. For example, in one alternative formulation the size variable was used as a deflator of the audit fees (similar to the

TABLE 2

SUMMARY DESCRIPTIVE STATISTICS BY CITY SIZE
(DATA FROM 1982 EXCEPT POPULATION WHICH IS FROM 1980)
($n=189$)

	Total Sample ($n=189$)			*Large Cities*[5] ($n=62$)			*Small Cities*[6] ($n=62$)			*t-statistic for Differences of Means Between Large and Small Cities*[4]
Variable	*Mean*[3]	*Range*	*Std. Dev.*	*Mean*[3]	*Range*	*Std. Dev.*	*Mean*[3]	*Range*	*Std. Dev.*	
Audit Fee[1]	$50,180	$7,350–561,000	$58,337	$86,153	$11,500–561,000	$88,303	$30,481	$10,000–75,000	$16,779	4.88*
Population (000)[1]	138	50–904	145	270	112–904	194	59	50–70	5.6	8.52*
Debt per Capita[1]	$705	$0–5,443	$710	$835	$19–3,192	$669	$599	$0–2,705	$558	2.13*
Bond Rating	6.3%	0–1		6.5%	0–1		8.1%	0–1		0.35
Service Index	2.4	0–7	1.5	2.9	0–7	1.6	2.1	0–6	1.3	2.90*
Number of Audit Reports[1]	3.1	1–14	2.4	3.3	1–14	2.6	3.2	1–11	2.4	0.11
CAFR	75%	0–1		74%	0–1		71%	0–1		0.40
Opinion Modification	28%	0–1		29%	0–1		37%	0–1		0.96
Tenure—Bid Cities[2]	4.5 yrs.	1–15 yrs.	3.5 yrs.	4.4 yrs.	1–15 yrs.	4.4 yrs.	4.0 yrs.	1–15 yrs.	3.0 yrs.	0.42
Tenure—non-Bid Cities[2]	7.9 yrs.	1–15 yrs.	5.3 yrs.	9.5 yrs.	1–15 yrs.	5.3 yrs.	8.7 yrs.	1–15 yrs.	5.7 yrs.	0.53
Busy Season	39%	0–1		40%	0–1		40%	0–1		0.00
Finance Officer Tenure	5.4 yrs.	1–15 yrs.	5.0 yrs.	6.6 yrs.	1–15 yrs.	4.9 yrs.	5.9 yrs.	1–15 yrs.	5.3 yrs.	0.81
Big Eight	47%	0–1		58%	0–1		40%	0–1		1.98**

* significant at .01

** significant at .05

[1] Variables not transformed, in the regression model these variables were transformed to their natural log.

[2] 21 of 62 large cities used regular bidding and, 35 of 62 small cities used regular bidding.

[3] Means for continuous variables, proportion of sample for 0/1 variables.

[4] For 0/1 variables, Z-statistics were calculated.

[5] Top third of sample ranked by population

[6] Bottom third of sample ranked by population

TABLE 3
SUMMARY DESCRIPTIVE STATISTICS BY AUDITOR SIZE
(DATA FROM 1982 EXCEPT POPULATION WHICH IS FROM 1980)
($n=189$)

	Big Eight ($n=89$)			*non-Big Eight* ($n=100$)			*t-statistic for Difference in Means Between Big Eight and non-Big Eight*[4]
Variable	*Mean*[3]	*Range*	*Std. Dev.*	*Mean*[3]	*Range*	*Std. Dev.*	
Audit Fee[1]	$62,461	$12,400–561,000	$75,912	$39,250	$7,350–226,100	$32,925	2.7*
Population (000)[1]	170	51–904	182	109	50–785	94	2.8*
Debt per Capita[1]	$793	$0–3,192	$655	$628	$6–5,444	$751	1.6
Bond Rating	3.4%	0–1		9.0%	0–1		1.6
Service Index	2.8	1–7	1.55	2.1	0–6	1.3	3.3*
Number of Audit Reports[1]	3.4	1–14	2.7	2.9	1–10	2.1	1.5
CAFR	77%	0–1		73%	0–1		0.7
Opinion Modification	33%	0–1		23%	0–1		1.5
Tenure—Bid Cities[2]	3.9 yrs.	1–15 yrs.	2.6 yrs.	5.2 yrs.	1–15 yrs.	4.4 yrs.	1.8**
Tenure—non-Bid Cities[2]	5.5 yrs.	1–15 yrs.	4.4 yrs.	9.5 yrs.	1–15 yrs.	5.3 yrs.	3.8*
Busy Season	42%	0–1		36%	0–1		0.8
Finance Officer Tenure	5.7 yrs.	1–15 yrs.	5.0 yrs.	6.4 yrs.	1–15 yrs.	5.1 yrs.	1.0

* significant at .01
** significant at .05
[1] Variables not transformed, in the regression model these variables were transformed to their natural log.
[2] 53 of 89 Big Eight cities use regular bidding and 44 of 100 non-Big Eight cities use regular bidding
[3] Means for continuous variables, proportion of sample for 0/1 variables.
[4] For 0/1 variables, Z-statistics were calculated.

Simunic [1980] formulation). A second alternative formulation was not taking the natural log form of the dependent variable as well as the appropriate independent variables. In virtually all of the formulations the significance of the variables remains the same as those reported here. The overall explanatory power of the model remains relatively constant as well. Discussion of the results concerning each of the variables is contained in the next section.

Tests for multicollinearity include an examination of both bivariate and multivariate correlations. The matrix of bivariate correlations is presented in Table 5. As shown in Table 5, most bivariate correlations are below .3. The only correlations higher than .3 are for city/auditor size variables, which is expected given the nature of these variables.

Multivariate correlation procedures suggest that only population and debt per capita may be significantly multicollinear with the remaining fee determinants. In order to determine which fee determinants are most likely affected by multicollinearity, a diagnostic procedure suggested by Belsley, Kuh, and Welsch [1980, ch. 3] was performed. The procedure uses condition indexes and variance-decomposition to identify which independent variables are most likely to be multicollinear. The largest condition index calculated was 44 (the next highest was 18), which does not indicate a high degree of multicollinearity. The only variables identified as having relatively high variance-decomposition proportions (above .3) were population and debt per capita. Thus, these two variables were considered the most likely candidates to be correlated and were, therefore, regressed on the remaining fee determinants. Neither of these regressions had an R^2 of above .25, thus, sug-

TABLE 4
MUNICIPAL AUDIT FEE MODEL
(1982 DATA EXCEPT FOR POPULATION WHICH IS FROM 1980)

$$\ell n(FEE) = b_0 + b_1 \ell n(POP) + b_2 \ell n(DEBT) + b_3 RATING + b_4 INDEX + b_5 \ell n(REP) + b_6 CAFR + b_7 MOD + b_8 TENBID + b_9 TENNOBID + b_{10} BUSY + b_{11} FOTEN + b_{12} SB8 + b_{13} LNB8 + b_{14} LB8 + u$$

ESTIMATED REGRESSION COEFFICIENTS (t-STATISTICS)

Variables	*Expected Sign*	*Total Sample* $n=189$	*Large Cities*[2] $n=62$	*Small Cities*[3] $n=62$
Intercept		6.223*	6.397*	9.65*
		(16.02)	(7.35)	(3.13)
Population (log)	+	0.667*	0.652*	−0.118
		(7.92)	(4.87)	(−0.16)
Debt per capita (log)	+	0.101*	0.078	0.069**
		(3.36)	(0.87)	(1.61)
Bond Rating	+	0.463*	0.961*	0.112
		(3.07)	(3.14)	(0.44)
Service Index	+	0.076*	0.050	0.044
		(2.90)	(1.10)	(0.85)
Number of Audit Reports (log)	+	0.122*	0.159**	0.174**
		(2.51)	(1.70)	(1.74)
CAFR	+	0.230*	0.390*	0.121*
		(2.76)	(2.53)	(1.74)
Opinion modification[1]	unknown	0.103	−0.136	0.274**
		(1.27)	(−0.81)	(1.92)
Tenure—Bid Cities	−	−0.019***	−0.040**	−0.005
		(−1.50)	(−1.74)	(−0.15)
Tenure—Non-Bid Cities	+	0.019*	−0.004	0.018***
		(2.41)	(−0.23)	(1.30)
Busy Season Audit	+	0.197*	0.278**	0.196***
		(2.59)	(1.80)	(1.33)
Finance Officer Tenure	−	−0.014**	−0.017	−0.001
		(−1.93)	(−1.15)	(−0.03)
Small City—Big Eight[1]	unknown	0.152		
		(1.44)		
Large City—Non-Big Eight[1]	unknown	−0.066		
		(−0.54)		
Large City—Big Eight[1]	unknown	0.064		
		(0.47)		
Big Eight[1]	unknown		0.274***	0.029
			(1.80)	(0.19)
R^2		.61	.64	.26
Adjusted R^2		.58	.56	.08
F-statistic		19.37*	7.39*	1.45***

* = significant at .01
** = significant at .05
*** = significant at .10

Chow test comparing large and small cities

Test statistic $\frac{(27.84-12.15-12.39)/12}{(12.15+12.39)/100} = 1.12 \sim F^{12}_{100}$ (not significant at .10) gesting that there is not a high degree of multicollinearity.

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[1] Two tail test, all others one tail
[2] Top third of sample ranked by population
[3] Bottom third of sample ranked by population

Both the inspection of residuals and the Goldfeld-Quandt test provide evidence that the disturbance terms are homoscedastic with respect to population (the Goldfeld-Quandt test yields an F-statistic of 1.04 which is not significant at the .05 level). Influential observations or outliers were assessed to determine whether any single or small group of observations had a significant influence on regression results. Influential observations were identified by residual inspection as well as a series of diagnostic procedures described in Belsley, Kuh, and Welsch [1980, ch. 2]. Although six potentially influential observations were identified, the total explanatory power of the model changes very little with the elimination of the observations. In addition, the significance of regression coefficients for the fee determinants change only slightly with the elimination of the identified observations.

In order to examine whether or not the estimated audit fee model was structurally constant across city population, a Chow test [Johnston, 1972, p. 207] was performed on the large and small city subsamples. Results of the Chow test, as reported in Table 4, suggest that the regression model coefficients are equal across city population.

V. DISCUSSION

Model

Results from the regression model using the entire sample (column 3 of Table 4) provides evidence that the municipal audit pricing model explains a significant proportion of the variance in audit fees. The overall model R^2 is .61 and the adjusted R^2 is .58. Most private sector audit fee studies report model adjusted R^2 slightly higher. Francis [1984], Palmrose [1986], Francis and Stokes [1986], and Francis and Simon [1987] all use a log-log audit fee model and report adjusted R^2 in the range of .45 to .89. Simunic [1980] reports an adjusted R^2 of .46, but uses a deflated audit fee (fee deflated by firm size) as the dependent variable.

Fee Determinants

Auditee size, as expected, explains significant variation of audit fees among municipalities. This result is consistent with private sector audit fee studies in which sales or assets are used as a size surrogate and always found to be significant.

Loss exposure is proxied by both per capita debt and bond rating. Empirical results suggest that both proxy variables are significant determinants of audit fees. Other versions of the debt variable gave approximately the same statistical results. Thus, cities that appear to be a greater financial risk are associated with higher audit fees.

Entity complexity, as measured by the previously described service index, is significant and has the expected sign. Audit report complexity is measured by three variables, the log of the number of separate audit reports, whether the statements are *CAFR*, and whether the opinion is modified. Both the log of the number of audit reports and the *CAFR* indication have the expected sign and are significant whereas opinion modification is not. The opinion modification results are inconsistent with prior audit fee studies. Reasons for the mixed results regarding audit opinion modification include the possibility that underlying events causing opinion modifications may vary substantially. Simunic [1980] and Palmrose [1986] generally find audit opinion modifications to have a significantly positive effect on fees. Francis [1984] and Maher et al. [1986] find both

TABLE 5

BIVARIATE CORRELATIONS OF ALL VARIABLES USED IN REGRESSION MODEL
($n=189$)

	Fee (log)	Pop *(log)*	*Debt per cap. (log)*	*Rating*	*Service Index*	*Reports (log)*	CAFR	*Opinion Mod.*	*Tenure—Bid*	*Tenure—Non-Bid*	*Busy*	*Finance Officer Tenure*	*Small Big Eight*	*Large Non-Big Eight*	*Large Big Eight*
Pop (log)	0.6240*														
Debt per cap. (log)	0.3772*	0.1864													
Rating	0.1728	0.0184	0.1390												
Service Index	0.3774*	0.2459*	0.2995*	−0.0618											
Reports (log)	0.1589	0.0372	−0.0521	−0.0401	0.0677										
CAFR	0.1477	−0.0121	0.1420	−0.0510	0.0198	0.1054									
Opinion Mod.	0.1005	0.0598	−0.0227	0.0339	0.0597	0.0639	−0.1115								
Tenure—Bid	−0.0177	0.1781	0.0496	0.0786	−0.0969	0.0459	0.0711	−0.0288							
Tenure—Non-Bid	0.0076	−0.1758	−0.0990	0.0711	−0.0738	−0.0293	0.0052	−0.1065	−0.4877*						
Busy Season	0.1985*	0.0313	0.2426*	−0.0283	0.0833	−0.0377	0.0290	0.0223	0.0745	−0.0755					
Finance Off. Tenure	−0.0741	−0.0239	0.1153	−0.0898	0.0231	−0.0534	0.0899	0.0520	−0.1083	0.1154	−0.0092				
Small—Big Eight	−0.1326	−0.3667*	−0.0655	−0.0223	−0.0580	0.1194	−0.0168	0.0752	−0.1126	−0.1187	0.0901	−0.0692			
Large—Non-Big Eight	0.0461	0.2761*	−0.0473	0.0106	−0.0855	0.0113	−0.0306	−0.1431	0.0713	0.1165	−0.1284	0.0637	−0.2763*		
Large—Big Eight	0.4001*	0.5635*	0.1894*	−0.1094	0.3217*	−0.0089	0.0740	0.0525	0.1059	−0.2155*	−0.0171	−0.0166	−0.3050*	−0.3349*	

* = significant at the .01 level

positive and negative effects of opinion modifications on fees, but none are significant. The private sector audit fee studies have relatively few opinion modifications in their samples. The percentage of opinion modifications ranges from approximately 5–15 percent whereas 28 percent of the cities received modified opinions. Since no analysis has been conducted on the underlying modifications, regression results regarding the relation of audit fees and opinion modification may be sample specific. For example, the effect of the SEC's prohibition of private sector "except for" audit opinions may be important.

Some of the events requiring modification of a city's audit report may relate to an increase in audit work or risk and, thus, are reflected in higher fees, other events may be neutral or relate to decreases in audit procedures or risks. For example, modifications because of limited scope may be less costly in fees because of fewer audit procedures performed by the auditor. It was not possible to determine the precise nature of the underlying event causing the modification for most cities in the sample. In addition, if audits are contracted on a fixed fee basis, as is common in government audit contracting, then unexpected opinion modifications may not be reflected in the audit fee.

Both auditor tenure variables have the expected sign and are significant. These results provide supporting evidence for both the Simunic [1980] and the DeAngelo [1981] hypotheses. The significant negative coefficient for the variable measuring auditor's tenure in cities which regularly obtain audit contract bids provides evidence supporting Simunic's expectation that auditor learning may take place and in some instances the benefit is passed to the auditee. The significant positive coefficient for the variable measuring auditor tenure in cities which do not regularly receive audit bids supports DeAngelo's expectation that audit fees may rise over time. A regression was estimated to isolate the separate effects of regular bidding practices and auditor tenure on audit fees. Results of this regression suggest that auditor tenure by itself is not significantly related to audit fees but cities which regularly solicit bids are associated with significantly lower audit fees.

Both DeAngelo [1981] and Francis and Simon [1987] suggest that initial audits performed by an auditor may be associated with lower audit fees because of "low balling." To ascertain whether initial municipal audits are systematically associated with lower audit fees an indicator variable was added to the regression model. Results suggest that cities which change auditors do not pay significantly different audit fees in the year after the change than cities which do not change auditors.

The two variables used to measure selected audit production factors, whether the audit is performed during the auditor's busy season and the auditee's chief financial officer tenure, are significant with the hypothesized sign. The result of the busy season variable suggests that cities pay systematically higher audit fees if the audit is performed when the opportunity cost of auditing is high. The negative coefficient associated with finance officer retention suggests that disruptions of key auditee personnel are costly in terms of audit fees.

The remaining variables in the regression model are the indicator variables used to measure the joint effect of auditor size and city size. As previously described, it is assumed that small cities purchase audits in a competitive market. The competitive nature of the large city audit market is assessed by determining whether the Big Eight can charge a premium in one audit market versus another. The coefficients for all of the indicator variables are not significant.

In the regression of the 62 largest cities the Big Eight indicator variable is significantly positive (see Table 4, col. 4). Since the Big Eight variable is not significant in the regression of the 62 smallest cities, this is suggestive of monopoly pricing by large audit firms in large cities. Additional diagnostic procedures [Belsley, Kuh, and Welsch, 1980, ch. 2] indicated three observations are influential in the large city regression results. Another regression was estimated without the three influential observations and the coefficient of the Big Eight variable was not significant. Therefore, most of the evidence suggests that Big Eight firms are not associated with significantly higher audit fees in either the large or small city market. Using the framework suggested by Simunic [1980] the results provide evidence that the large city audit market is competitive.

Simunic's [1980] results suggest that a specific Big Eight audit firm may more likely be associated with higher audit fees. To ascertain whether any of the Big Eight were more likely to be associated with significantly higher or lower audit fees in municipalities, the Big Eight indicator variable was replaced with an indicator variable for each of the Big Eight firms. None of the coefficients for the individual Big Eight firm indicator variables are significant. The municipal audit market, unlike certain private sector audit markets, is not dominated by a specific audit firm or even a small group of audit firms. For the total sample, no audit firm audited more than 12 percent of the cities and the top four firms audit only 32 percent of the cities. Since data regarding the identity of auditors for the total municipal audit market are not readily available, it is difficult to compute market share of each audit firm. The market share percentages computed from the sample of cities used in this study are much lower in comparison to the private industry market shares computed by Palmrose [1986] and Eichenseher and Danos [1981].

VI. SUMMARY AND CONCLUDING COMMENTS

The intent of this study is to extend understanding of the audit pricing practices and audit markets, particularly for municipalities. An audit fee model is constructed which is able to explain a significant portion of the variance in audit fees of municipalities. Results suggest that a number of variables are significantly related to audit fees for the year 1982. Evidence is also obtained regarding the competitive nature of the municipal audit market.

Results suggesting a significant positive relation of organization size and audit fee is similar to prior audit fee studies. Auditor loss exposure, although measured differently in municipalities than private firms, is also a significant fee determinant. This is evident by the positive relation between the municipality's audit fee and its bond rating and debt per capita.

Entity complexity, which for municipalities is measured by a service index, also has a significant relation with audit fees. Report complexity is captured by three variables. Two of the variables, number of audit reports and opinion modification, are used in private sector fee studies. Number of reports, similar to results of other audit fee studies, has a significant positive relation with audit fee. Opinion modification is not significantly related to audit fee. The third report complexity variable, an indication if the report is a *CAFR*, is unique to the government financial reporting environment and is positively related to audit fees.

Auditor tenure is measured by two variables. Although some of the prior audit fee studies have used a tenure variable, this study attempts to differentiate between those municipalities likely to receive the benefit of auditor learning and those likely to be charged quasi-rents. Results suggest that both auditor learning and costly contracting may affect audit fees though cities differ in propensities to solicit bids. Regularly soliciting audit bids as a variable by itself is associated with lower audit fees. Auditor tenure and first audits are not found to explain significant variance in audit fees. Results suggest the joint effect of soliciting bids and auditor tenure is an important interaction affecting audit fees.

The last set of variables used in the municipal audit fee model capture the interaction of auditor and auditee size. Using the Simunic [1980] framework, results suggest that the municipal audit market in 1982 is competitive.

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Consistency Exceptions: Materiality Judgments and Audit Firm Structure

Michael H. Morris and William D. Nichols

ABSTRACT: This study examines empirically three aspects of auditor materiality judgments: (1) their association with publicly available financial information, (2) whether materiality judgment consensus differs across Big Eight audit firms, and (3) whether judgment consensus is correlated with audit firm structure. The results suggest that nine publicly available financial measures explain a significant portion of the variability in auditor materiality judgments, thereby raising a question about potential information in auditors' interest-capitalization consistency exceptions. Although publicly available financial information was found to be significantly associated with materiality judgments in each Big Eight firm, the judgment consensus of consistency opinion decisions varied among individual Big Eight firms. Not only were there significant differences in judgment consensus among firms but also a significant positive association was found between audit judgment consensus and the degree of audit structure, thereby providing empirical evidence that audit structure may influence audit judgment.

USING a unique set of publicly available financial information, this study tests the information in a particular type of consistency exception and provides evidence that the consensus[1] of opinion-formulation (materiality-judgment) decisions varies across Big Eight audit firms and is correlated with audit firm structure. The study is motivated by two separate issues, both of which are derived from prior research.

First, Mutchler [1985] used publicly available information to predict auditors' opinion decisions, concluding that going-concern "subject-to" opinions do not necessarily add information beyond that otherwise available in published financial statements.[2] Thus, in contrast with prior audit judgment research, most of which used human subjects in controlled behavioral experiments (e.g., Boatsman and Robertson [1974], Hofstedt and Hughes [1977], Messier [1981, 1983], Moriarity and Barron [1976, 1979]), publicly available financial information is used to model actual opinion decisions. This approach provides a basis for determining whether a particular audit opinion signal (i.e., audi-

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[1] Judgment *consensus* is used here to mean dispersion of actual judgments from a model and not as it is frequently used in the behavioral literature to mean agreement among decision makers evaluating a hypothetical case where no objective external criterion exists.

[2] Using six financial ratios and the prior-year audit opinion, Mutchler [1985] correctly predicted 89.9 percent of the going-concern opinion decisions.

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Michael H. Morris and William D. Nichols, both at the University of Notre Dame.

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tors' consistency exception opinions for changes in interest capitalization accounting) is captured in published financial information.[3]

Second, recent research on the audit methods of large public accounting firms [Kinney, 1986; Cushing and Loebbecke, 1986] suggests that audit decision making is not independent of audit firms' technological preferences for structured versus unstructured auditing. Big Eight audit firms' technological preferences, termed "audit structure" in this paper, are specifically incorporated in the research design thereby providing a basis for concluding whether audit judgment consensus is associated with audit structure.

To test the potential information in interest-capitalization consistency exceptions and the impact of audit structure on audit judgment, we compiled publicly available data on companies' initial application of Financial Accounting Standards Board (FASB) *Statement of Financial Accounting Standards (SFAS) No. 34*, "Capitalization of Interest Cost" [FASB, 1979]. This statement establishes standards for capitalizing interest when a company acquires certain assets. Initial applications of SFAS No. 34 provide a data set that allows for testing audit materiality judgments because: (1) for companies that previously expensed interest, capitalization of interest costs is a change in accounting method; and (2) if the change is material, an Auditing Standards Board Interpretation issued February, 1980, entitled "The Effect of FASB Statement No. 34 on Consistency" [AICPA, 1987, par. 9420.32], requires a qualification for inconsistency. Thus, initial adoption of the SFAS No. 34 method provides a discrete population of accounting-change companies and an indication of whether a materiality threshold has been exceeded, since an adopting company's published annual report will include both a footnote describing the change in accounting method (i.e., a means to identify adopting companies) and a consistency exception if the auditor deems the change material (i.e., a means to determine the auditor's materiality judgment).

Our results suggest that: (1) materiality judgments involving consistency exceptions are associated with publicly available financial information; (2) differences in judgment consensus exist among Big Eight firms; and (3) there is a significant positive correlation between judgment consensus and audit firm structure. The next two sections present the rationale and hypotheses and the research methods and data. Results are then presented followed by a summary and concluding remarks.

RATIONALE AND HYPOTHESES

Materiality Judgments and the Information Content of Interest-Capitalization Except-for Opinions

Prior studies have examined auditors' materiality judgments at both the planning stage (audit materiality) and the evaluation stage (financial statement materiality). This study focuses on the evaluation stage, since evaluation stage materiality decisions are discernable from publicly available financial information, whereas planning stage materiality decisions are proprietary. Most practitioners and academics agree on a conceptual definition of evaluation stage materiality,[4] but disagree on an operational definition. In fact, practitioners have failed to establish quantitative standards of materiality and researchers have consistently reported a lack of consensus among auditors making materiality judgments.[5]

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[3] Mutchler's [1985] study was motivated by the Auditing Standards Board's attempt to eliminate the going-concern subject-to opinion. Certain members of the financial community believed that auditors were privy to inside information and, therefore, in a better position to predict business failures than were agents outside the firm.

In several judgment-capturing studies, subjects were asked to judge materiality based on hypothetical case materials (e.g., Boatsman and Robertson [1974], Moriarity and Barron [1976, 1979], Hofstedt and Hughes [1977], Firth [1979], Emery, Thakkar, and Moriarity [1981], Messier [1981, 1983], and Krogstad, Ettenson, and Shanteau [1984]). Even though the particular research question under investigation varied widely across these studies, the effect of the judgment item relative to net income dominated the auditors' materiality decision.

However, the use of income as a relative measure has limitations, since the selection of accounting methods (e.g., method of recognizing investment tax credit, depreciation method, and inventory flow method) directly affects the measurement of income, thereby making between-firm materiality comparisons difficult. Sales revenue, in contrast, is for the most part independent of accounting method choices. A materiality measure using sales revenue as a base is supported in recent research on planning stage and evaluation stage materiality decisions. Warren and Elliott [1986] obtained materiality estimates from the working papers of 60 CPA firms and found a significant positive relation between the materiality threshold and sales revenue with less heteroscedasticity than for the relation with net income.[6]

Other materiality-related measures, most of which have been tested in the above studies but with mixed results, include total assets, net worth, the asset account associated with the judgment item (e.g., net property, plant, and equipment), the debt-to-equity ratio, the net income-to-equity ratio, a measure of the client's size (e.g., total market value of equity), and the effect of the judgment item on earnings trend. Thus, prior research suggests that the selection of the explanatory variables is an important consideration when modeling the materiality judgments of individual auditors.

By construction, many of the measures are highly correlated. But, because this study is not concerned with the incremental contribution of the individual explanatory variables and since individual Big Eight firms have not publicly disclosed which bases they use when making materiality judgments,[7] all bases are used in the research design.

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[4] Statement of Financial Accounting Concepts No. 2 defines materiality as "the magnitude of an omission or misstatement of accounting information that, in the light of surrounding circumstances, makes it probable that the judgment of a reasonable person relying on the information would have been changed or influenced by the omission or misstatement" [FASB, 1980, par. 132]. *Statement on Auditing Standards No. 47*, "Materiality and Audit Risk in Conducting an Audit," the auditor's guidelines for materiality decisions at the *aggregate or financial statement level* (i.e., the evaluation stage), quotes this definition verbatim [AICPA, 1987, par. 312.06].

[5] The lack of general standards of materiality are not all pervasive. For example, some official pronouncements of the Accounting Principles Board (APB) and FASB contain ad hoc quantitative measures of materiality, including APB Opinion No. 15 [par. 15] which sets a three percent threshold that allows a company with a complex capital structure to report a single presentation EPS number and FASB Statement No. 14 [par. 15] which sets a ten percent threshold used to identify reportable segments. In addition, the Fiji Institute of Accountants, in Accounting Standard 101 [1979], states that the judgment item should be compared to base amounts defined in the statement. If the resulting ratios from the comparison: (1) are equal to or greater than ten percent, then the item is presumed material; (2) are equal to or less than five percent, then the item is presumed immaterial; or (3) lie between five percent and ten percent, then the item is a judgment item. A similar guideline exists in Australia.

[6] Warren and Elliott [1986] use R-squared values as a measure of strength of the relation between the materiality threshold and the independent variable. The explanatory variables and respective R-squared values were as follows: sales revenue, .76; net income, .91; and net income before tax, .93.

Previous studies have found only moderate judgment consensus *between-subjects*. This is somewhat surprising given that most of these auditors had completed a formal education process, had passed a standardized examination, and were experienced. This study also examines *among-firm* materiality judgment consensus; that is, materiality decisions at the audit firm level. We expect to find a higher degree of consensus within audit firms than between or among firms, since audit judgments may reflect firm policies, differences in firms' loss functions [Kida, 1980; Altman, 1982], aversion to risk [Shank and Murdock, 1978; Mutchler and Williams, 1986], or the cost of liability insurance [Lewis, 1980], among other things.

At the audit firm level, hypothesis one considers whether a model that uses publicly available financial information can capture Big Eight audit firms' consistency exception decisions. Hypothesis one, stated in the null form, is:

> H_1: Interest-capitalization consistency exception decisions of Big Eight firms are not associated with publicly available financial information.

If rejected, H_1 would provide an empirical basis for questioning whether interest-capitalization consistency exceptions can provide additional information beyond that otherwise captured in publicly available financial data. Also addressed, within the context of initially applying SFAS No. 34, is the assertion that no general standard of materiality can be formulated given all the considerations that enter into experienced human judgment [FASB, 1980, par. 131].

Materiality Judgments and Audit Firm Structure

Two recent studies provide initial evidence that audit decision making may not be independent of audit firm structure. Cushing and Loebbecke [1986] classified 12 large public accounting firms into four types of audit methodologies (unstructured, partially structured, semi-structured, and highly structured), and Kinney [1986] classified Big Eight firms into three types of audit technology (unstructured, intermediate, and structured).

In reviewing materiality judgment guidelines, Cushing and Loebbecke [1986] noted that five of the 12 CPA firms analyzed did not provide guidelines nor did they require that their auditors quantify planning stage estimates of materiality. Three of the remaining seven firms provided extensive, conceptual discussions of materiality, with two of these firms providing specific analytical approaches for determining amounts and incorporating them into the latter steps of the audit process. These documented differences in planning stage materiality guidelines suggest that evaluation stage materiality judgment consensus could be affected by audit firm structure.

Neither Cushing and Loebbecke [1986] nor Kinney [1986] report structure measures for the firms studied, rendering their reported results inappropriate for the empirical tests used in this study. However, Kinney has provided us with each Big Eight firm's measure, thereby providing a basis for evaluating among-firm materiality decisions in the context of audit structure. Kinney's measures were calculated in the following manner. Four members of the Auditing Standards Board, with knowledge of the various firms' audit practices, were asked to rate the degree of audit structure on a scale from one to three (one = least structured, three = most structured). An executive office technical partner in each firm was also asked to rate their firm on the same scale. Therefore, the maximum rating for a firm would be 15 (three points for each of four expert opinions, plus three points for one self-rating) and a minimum rating would be five.

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[7] To our knowledge, only Peat Marwick Mitchell has publicly disclosed its materiality guidelines, and those guidelines relate to planning stage materiality. See Elliott [1983].

Two firms, Peat Marwick Mitchell (PMM) and Deloitte Haskins and Sells (DHS), received the maximum audit-structure rating of 15, while Price Waterhouse (PW) and Coopers & Lybrand (CL), received the minimum rating of five. Touche Ross (TR) received an audit-structure rating of 13, Arthur Andersen (AA) 11, Arthur Young (AY) ten, and Ernst and Whinney (EW) ten. Not only was there unanimity about the two most and two least structured Big Eight firms, but the Spearman rank order correlations between all pairs of the five evaluations were .80 or above and significant at the .01 level, suggesting highly consistent rankings.

The variation and perceived consistency in audit structure among Big Eight firms (from a low rating of five to a high of 15) introduces the possibility that between-firm differences in materiality judgments reflected in consistency exceptions may be related to audit firm structure. This suggests two additional hypotheses, presented in null form.

H_2: The consensus of interest-capitalization consistency exception decisions does not vary among Big Eight firms.

H_3: The correlation of audit firm structure with the consensus of interest-capitalization consistency exception decisions is less than or equal to zero.

Hypotheses two and three are a direct result of Cushing and Loebbecke [1986] and, more specifically, Kinney [1986]. Kinney [1986, p. 75] speculated that structured firms would specify conditions under which the auditor is to modify the audit opinion, while unstructured firms would likely emphasize the need for individual judgments and would accept reasonable variation in audit reports under seemingly similar circumstances. Both studies suggest that auditor judgment consensus would be affected by audit firm structure, with more structured firms exhibiting greater consensus.[8]

Assuming publicly available financial information is associated with materiality judgments (i.e., H_1 rejected) and that opinion-formulation differences exist between Big Eight firms (H_2 rejected), a positive correlation is expected between firms' consistency exception consensus and audit firm structure. Hypothesis three is, therefore, a one-tailed test with the alternative hypothesis that the correlation is greater than zero. For this particular audit decision (i.e., to qualify an audit report for a consistency exception when initially applying SFAS No. 34) it is hypothesized that audit firm structure will partially explain among-firm differences in materiality judgment consensus.

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[8] The structured-unstructured firm classifications in Cushing and Loebbecke [1986] and Kinney [1986] considered several elements of audit structure such as use of statistical sampling and use of formal scoring sheets. The consistency of the audit structure classification across all elements measured in these two studies and the documented differences in *planning stage* materiality guidelines in Cushing and Loebbecke provide the basis for expecting that the structured-unstructured designation holds with respect to *evaluation stage* materiality judgments.

RESEARCH METHODS AND DATA

Model Formulation

If a quantitative measure can capture the essence of auditors' materiality decisions within an audit firm, there would be little overlap in the within-firm distribution of material and immaterial judgments when using the quantitative measure to discriminate. This study utilizes a multivariate measure to minimize the overlap of the material with the immaterial judgments. For example, interest capitalized as a percent of income or interest capitalized as a percent of total assets may individually provide large amounts of overlap. However, when used together, the combined measures are expected to reduce overlap.

A logistic multiple regression model was used to fit the independent variables (the quantitative materiality bases) to a binary dependent variable representing the materiality judgment (material (0) or immaterial (1)). The model follows:

$$Y=f(\text{IC/NI, IC/SALES, IC/ASSETS, IC/PLT, IC/NETW, DEBT/EQUITY, NI/EQUITY, TREND, EQUITY}) \tag{1}$$

where

Y	is 0 for cases judged material by the auditor and 1 for cases judged immaterial;
IC/	is interest capitalized (IC) divided by net income (NI),[9] net sales revenue (SALES), total assets (ASSETS), net property, plant, and equipment (PLT), and net worth (NETW), respectively;
DEBT/ EQUITY	is the debt-to-equity ratio (see EQUITY below);
NI/EQUITY	is the net income-to-equity ratio;
TREND	is the percentage change in income from the year immediately prior to disclosure of the initial application of SFAS No. 34; and
EQUITY	is the market value of equity calculated at the end of the fiscal year in which SFAS No. 34 was initially applied.

For modeling materiality judgments, prior research (e.g., Emery, Thakkar, and Moriarity [1981]; Moriarity and Barron [1976]) indicates that an additive (linear) model is appropriate; that is, nonlinear models may not, in a statistical sense, perform better. However, in an effort to allow for some variation in the judgment model's functional form at the audit firm level, the best fitting logit model, as measured by the likelihood ratio test, was selected after considering the following transformations: linear, logarithmic, square root, squared, and reciprocal. This set of transformations includes a wide range of functional forms where the exponent varies from -1 to $+2$.

The nature of the logistic regression model is such that if the predicted score from equation (1) is negative, then the observation will be classified as material. Since many of the independent variables are highly correlated (by construction) and since all nine variables are included in every model, no attempt is made to determine either the sign or the significance of individual coefficients. Rather, this study concentrates on the association of the nine aggregated independent variables with the auditors' opinion-formulation decisions. Once the best fitting model for each Big Eight firm had been derived, using all nine independent variables and the best of the five functional forms, the consistency of the model with auditor judgments was addressed. As presented in Leach [1979, p. 80] and explained in the following paragraphs, the Somers' Delta (*D*-statistic) is an appropriate measure of association between auditor judgments and publicly available financial information.

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[9] The absolute value of income is used in the denominator of IC/NI and TREND. Several other definitions of income were also examined for completeness and are discussed in the sensitivity of results section.

The logit model combines the nine publicly available financial variables into a single measure which indicates probability of membership in the material or immaterial judgment group. Somers' *D* examines each pair of dissimilar dichotomous dependent variables (all possible pairs of immaterial/material judgments) from the auditors' actual decisions. If the logit model provides a higher probability of membership in the immaterial (material) group for an immaterial (material) judgment, then concordance between the model and the pair of judgments is obtained. By subtracting the number of discordant pairs of auditor judgments (disagreements) from the number of concordant pairs (agreements) and dividing that difference by the total number of dissimilar dichotomous pairs yields the Somers' *D*, which represents the net agreement or association between the logit model and actual auditor judgments. A Somers' *D* value of +1 indicates perfect agreement or consensus. A Somers' *D* of zero suggests no association between the logit model and the auditor judgments, since an equal number of concordant and discordant pairs will exist.

As pointed out by Leach [1979], Somers' *D* is a nonparametric measure of association similar to other association measures such as Kendall's tau *b* or Goodman and Kruskal's gamma. More importantly, the Somers' *D* metric possesses two necessary characteristics for this study. First, it provides a finer measurement of association than the metric representing the percentage of cases correctly classified. The percentage correctly classified uses a .50 probability of membership as a cutoff. Therefore, observations with membership probabilities of .51 are classified exactly the same as observations with membership probabilities of .99. Since no distinctions are made between these two cases, some information is not being utilized and cruder measurements result. Since a logit model provides probabilities from a continuous distribution, Harrell [1983] suggests that a better measure for assessing association is a rank correlation between the model-provided probabilities and the dichotomous dependent variable, like the Somers' *D*. The advantage offered by Somers' *D* is that it uses the continuous probabilities of membership rather than the forced categorical grouping based on a .50 cutoff.

A second important characteristic of Somers' *D* is that it can be interpreted as a measure of consensus. Consensus relates primarily to dispersion or variance of judgments, and this is precisely what Somers' *D* is capturing. The method of measuring judgment consensus in this study differs from the more traditional laboratory setting where dispersion of judgments is measured by having a group of auditors make materiality judgments relative to one hypothetical case. The present method, instead, uses the real-world setting where each auditor makes a materiality judgment on a unique case.

The logit models derived in this study are those that best fit the data over a wide variety of materiality variables and functional forms. The best fitting logit models are a compromise or average of the extreme relationships suggested by the data and in this sense, provide a measure of central tendency. Positive Somers' D values indicate more concordance than discordance or more agreement with the logit model, a model representing central tendency. Negative Somers' D values suggest more disagreement, more dispersion from the measure of central tendency, and less consensus.

Data

SFAS No. 34 was to be applied prospectively for fiscal years beginning after December 15, 1979; however, companies could choose an early application. As a result of this flexibility, a company's initial application could have appeared in its 1979, 1980, or 1981 financial statements. The American Institute of Certified Public Accountants' National Automated Accounting Retrieval System (NAARS) was used to generate the sample. It included all industrial firms that met the following criteria:[10]

1. The company's annual report appeared on the 1979/1980 or 1980/1981 NAARS Annual Report File and contained in its footnotes either the phrase "capitalization of interest" or "No. 34";
2. The footnote disclosure pertained to the initial application of SFAS No. 34 and stated the dollar amount of interest capitalized; and
3. Data were available to compute the nine quantitative materiality bases.

A sample of 361 companies was obtained using these selection criteria; 334 were clients of Big Eight firms. The audit report of each company was examined and 127 contained an interest-capitalization consistency exception. Therefore, the amount of interest capitalized was judged material for 127 of the companies and immaterial for the remaining 207.

Each sampled company was publicly traded and was listed on the NYSE or the AMEX or sold OTC. Since NAARS contains over 4,000 annual reports, it represents a majority of all large publicly traded firms. The proportion of companies on NAARS disclosing interest capitalized is not expected to be different from the proportion in the general population disclosing interest capitalized. As a result, this sample is believed to be large, representative, and relatively free of the choice-based sample biases discussed by Zmijewski [1984].

The NAARS files and monthly issues of the Standard & Poor's *Security Owner's Stock Guide* were used to obtain data for the nine materiality bases used as independent variables in equation (1). Means by immaterial and material judgment are reported in Table 1. For each Big Eight firm, with two exceptions (IC/PLT for AY and IC/NETW for PW), the five interest capitalized (IC) ratio means (panel A) were greater for the material judgments than for the immaterial judgments, and for 35 of these 38 comparisons, the difference was significant at the .05 level, suggesting potential discriminating ability.[11] The four non-IC

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[10] To keep the sample relatively homogeneous, we eliminated utilities, financial institutions, and real estate investment trusts.

[11] The discriminating ability of the interest-capitalized ratios was highlighted using a univariate modeling analysis. This analysis identified the best fitting univariate logit model for each Big Eight firm using the nine explanatory variables in their five functional forms. The materiality base IC/SALES dominated the univariate models of PMM, DHS, AY, and PW while the models of both AA and CL were dominated by the IC/NI measure. The

TABLE 1

MEAN VALUES FOR EACH MATERIALITY BASE AND TESTS FOR DIFFERENCES BETWEEN IMMATERIAL AND MATERIAL JUDGMENTS AND DIFFERENCES ACROSS CPA FIRMS

A. Interest Capitalized Bases:

Unit of Analysis	n		IC/NI			IC/SALES			IC/PLT			IC/ASSETS			IC/NETW		
	IMM[a]	MAT[b]	IMM	MAT	Z-Score[c]	IMM	MAT	Z-Score	IMM	MAT	Z-Score	IMM	MAT	Z-Score	IMM	MAT	Z-Score
All Firms:	207	127	.078	.221	9.42**	.003	.011	8.87**	.009	.022	7.02**	.003	.007	9.10**	.010	.021	9.24**
By Firm:																	
PMM	30	12	.074	.140	3.86**	.002	.021	4.36**	.009	.016	1.99*	.003	.007	3.75**	.007	.054	3.75**
DHS	16	15	.057	.246	2.55**	.002	.030	4.13**	.005	.058	3.93**	.002	.010	4.05**	.005	.023	3.78**
TR	12	17	.060	.132	2.37*	.003	.006	2.33*	.007	.016	2.41*	.003	.006	2.50**	.007	.027	2.55**
AA	32	17	.067	.312	4.32**	.005	.009	2.87**	.015	.016	3.27**	.004	.008	3.85**	.010	.021	4.06**
AY	23	10	.062	.278	2.84**	.004	.007	2.72**	.013	.011	1.43*	.004	.006	2.29*	.009	.017	2.33*
EW	21	20	.058	.246	2.96**	.002	.004	1.81	.006	.010	1.40	.003	.004	2.41*	.006	.010	2.47**
PW	48	21	.130	.203	4.13**	.002	.007	4.26**	.007	.025	2.63**	.003	.007	4.18**	.019	.016	3.97**
CL	25	15	.046	.208	2.38*	.003	.010	2.79**	.008	.020	1.67	.003	.005	2.21*	.006	.012	2.43*
Chi-Square Value[d]			2.03	9.41		3.44	20.81**		2.41	8.57		3.48	15.74*		3.08	14.58*	

B. Other Bases:

Unit of Analysis	n		DEBT/EQUITY			NI/EQUITY			TREND			EQUITY		
	IMM[a]	MAT[b]	IMM	MAT	Z-Score[c]	IMM	MAT	Z-Score	IMM	MAT	Z-Score	IMM	MAT	Z-Score
All Firms:	207	127	1.386	1.744	2.12*	.109	.073	.87	.176	.647	.52	7.185	7.124	1.57
By Firm:														
PMM	30	12	1.130	1.062	.21	.113	.076	1.18	.650	1.177	.21	3.940	4.589	.99
DHS	16	15	1.509	1.346	.46	.098	.141	.77	−.127	.583	1.32	8.943	14.184	1.09
TR	12	17	1.999	2.514	.02	.036	−.180[e]	.51	−.368	2.069	.82	2.488	.993	1.00
AA	32	17	.809	1.702	2.47**	.096	.101	.05	.153	.060	.81	8.267	6.690	2.22*
AY	23	10	1.177	1.468	.73	.130	.061	1.20	.303	.947	1.39	9.335	4.769	1.78
EW	21	20	1.635	2.396	.43	.141	.161	.33	.030	.609	.01	6.344	4.513	2.52*
PW	48	21	1.906	1.569	.67	.111	.107	.37	.149	−.001	.66	6.203	14.869	1.75
CL	25	15	1.045	1.426	.36	.112	.097	1.12	.152	.094	1.06	11.434	3.745	.33
Chi-Square Value[d]			11.93	5.29		5.92	6.92		10.13	3.44		6.81	26.61**	

[a] IMM=Immaterial audit judgments.

[b] MAT=Material audit judgments.

[c] Z-Score from Wilcoxcon Rank-Sum Test for differences between immaterial and material judgments.

[d] Chi-Square value from Kruskal-Wallis Test for differences across CPA firms.

[e] Includes Chrysler Corporation which incurred a $1.709 billion loss.

* Significant at the .05 level.

** Significant at the .01 level.

materiality bases (Table 1, panel B) were included to be consistent with prior research, although the potential discriminating ability of each of these four materiality bases taken alone appears to be slight.[12]

Table 1 also presents results of nonparametric tests for differences of mean values across Big Eight firms for each of the nine materiality bases. The equality of means for the immaterial judgments cannot be rejected for any of the bases. However, four of the nine bases have significantly different mean values for the material judgments. These results indicate differences in measures of central tendency across CPA firms for the effect of SFAS No. 34, but do not necessarily indicate differences in materiality threshold.[13]

Since the data used in the nine bases were collected from actual financial statements rather than set by the researcher in a controlled experiment, this study should have external validity, but there is a lack of control over the randomness of sampled companies' independent variables across audit firms. In short, the logit model's discriminating ability may be affected by the clustering of the base variables. For example, some Big Eight firms may have materiality bases grouped in the tails of the distribution, making discrimination easy. On the other hand, other firms could have materiality bases clustered near a given value, thereby allowing poor discrimination simply because of the values of the materiality bases associated with those firms' client companies.

To test for this possible "clientele effect," a preliminary analysis of the data was conducted. Using the total sample, each of the nine materiality bases were ranked from smallest to largest and the rankings were used to identify cutoff values for the first and third quartiles. Using these cutoff values, the proportion of materiality bases appearing in the two middle quartiles was determined for each Big Eight firm and each of the nine independent variables. For each independent variable, statistical tests were performed on the differences between proportions for all possible paired Big Eight firm comparisons. Of the 252 two-way comparisons, only 14 yielded significant differences at the .05 level (i.e., approximately five percent of the paired comparisons were significant, or what might be expected by chance). As a result, there do not appear to be any systematic differences in the distribution of the materiality bases between audit firms, suggesting that each Big Eight firm had a representative subsample of companies.

Industry clustering is another potential bias associated with data collected from real-world sources. In at least two ways, the logit model's discriminating ability could be affected by differences in the industry membership of the individual audit firms' client portfolios. First, the ability of a logit model to capture auditors' materiality judgments could significantly vary across industries. To the extent that industry con-

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univariate logit models of TR and EW were dominated by IC/NETW and IC/ASSETS, respectively. Therefore, four of the five interest-capitalized ratios were identified by a CPA firm's model as the explanatory variables possessing the most discriminating ability.

[12] For Coopers and Lybrand, the significance of the logit model reaches its maximum using a subset of the nine explanatory variables. However, using all nine measures in the CL model does not affect our results.

[13] For tests of differences in materiality thresholds across Big Eight firms, the relevant statistic is not the mean value of the independent variables, but a value which perfectly distinguishes material from immaterial judgments. Since the distribution of material judgments overlaps the distribution of immaterial judgments for each base, two thresholds arise for each audit firm. The lower threshold is the value below which all values result in immaterial judgments and the upper threshold is the value above which all values result in material judgments.

centrations vary across audit firms, the ability to model a firm's materiality judgments could vary accordingly. This would cause a problem in interpreting the results if materiality judgments from hard-to-model (easy-to-model) industries were systematically concentrated within the client portfolios of unstructured (structured) audit firms. Second, materiality judgments of audit firms having more diverse industry bases within their client portfolios could be more difficult to model since, within firm, a single logit model is applied across all industries. Again, this would cause a problem if more diverse (concentrated) industry bases were systematically associated with unstructured (structured) audit firms.

Table 2 provides evidence on the industry concentration of the Big Eight firms' client portfolios for our sample. Within industry (the analysis by row in Table 2), no CPA firm, except PMM, appears to be overly represented in any of the ten industry groups. In the sample, PMM has approximately 24 percent of its clients in the mining and petroleum industry while for all Big Eight firms, the average concentration in this industry is 7.5 percent. This is the only combination for which the probability is less than .05 that a firm's proportion was selected from a population with the proportion defined by the remaining firms. PMM is classified as a structured firm, therefore, if relative to other industries the materiality judgments associated with mining and petroleum are significantly easier to model, then the sample results would be biased toward rejecting hypotheses two and three.

No audit firm (analysis by column in Table 2), had more than 29 percent of its clients in any one industry group, but each firm had one industry group containing at least 20 percent of its clients. Only EW has more than one industry group with a concentration percentage greater than 20 percent. There does not appear to be any systematic relation between industry concentration and audit firm structure.

RESULTS

Hypothesis One

To test H_1 concerning the possible information in interest-capitalization consistency exceptions, logit regressions were estimated using publicly available financial information (the nine materiality bases). To allow for the possibility that different audit firms effectively emphasize certain materiality bases or use alternative functional relations between bases, two procedures were followed. First, for each firm all nine bases[14] were included in the logit model, with the weight assigned to each determined by maximum likelihood.[15] Second, a wide range of functional forms of the logit model (linear, logarithmic, square root, square, and reciprocal) were investigated and the best fitting functional form was selected. Results from the test of hypothesis one are presented in Table 3.

As shown in Table 3, six of the Big Eight firm models have a chi-square value significant at the .01 level with the models of the other two firms, EW and CL, being significant at the .05 and .07 levels, respectively. The model chi-square statistic is −2 times the difference between the log of the likelihood function for the full model and that of a model with an intercept only. Although the best

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[14] Since two bases, TREND and NI/EQUITY took on negative values for several of the observations, the logarithmic and square root functional forms of the logit models could not include these two variables.

[15] Because each firm's model suffered from the presence of high multicollinearity, neither the individual coefficients nor their significance levels are presented.

TABLE 2
PERCENTAGE DISTRIBUTION BY SIC CODES OF SAMPLED COMPANIES ACROSS CPA FIRMS

			CPA Firm							
Industry Name	*SIC Codes*	*All Firms*	*PMM*	*DHS*	*TR*	*AA*	*AY*	*EW*	*PW*	*CL*
Mining and Petroleum	10–14	7.5%	23.8%	3.2%	3.5%	12.3%	9.1%	2.4%	2.9%	2.5%
Food	20–21	7.2%	7.1%	12.9%	0.0%	6.1%	6.1%	4.9%	8.7%	10.0%
Paper and Publishing	26–27	7.2%	2.4%	9.7%	6.9%	2.0%	3.0%	9.8%	11.6%	10.0%
Drugs, Chemicals, Rubber, and Glass	28–32	19.8%	16.8%	29.0%	10.3%	20.4%	15.1%	22.0%	23.2%	17.5%
Primary and Fabricated Metals	33–34	11.4%	2.4%	9.7%	13.8%	10.2%	6.1%	14.6%	17.4%	12.5%
Machinery and Equipment	35–39	18.0%	9.5%	16.1%	17.2%	16.3%	24.2%	24.4%	16.0%	22.5%
Transportation and Communications	40–48	6.3%	7.1%	9.7%	6.9%	6.1%	6.1%	2.4%	4.3%	10.0%
Wholesale and Retail Trade	50–59	11.6%	11.9%	6.5%	24.1%	12.3%	12.1%	12.2%	8.7%	10.0%
Service	72–89	7.2%	14.3%	0.0%	13.8%	8.2%	12.1%	4.9%	4.3%	2.5%
Other	•	3.8%	4.7%	3.2%	3.5%	6.1%	6.1%	2.4%	2.9%	2.5%
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

• Seven SIC codes are represented in the "Other" category.

TABLE 3
LOGIT RESULTS FOR INDIVIDUAL BIG EIGHT AUDIT FIRMS

			Other Association Metrics			
			Percent Correctly Classified			
Audit Firm	Form of Model[a]	Model Chi-Square	By Model	By Chance[c]	Model/ Chance Ratio	Somers' D
PMM	LOG	37.62**	95.2	59.2	1.61**	.969**
DHS	SQRT	29.43**	90.3	50.1	1.80**	.933**
TR	LINEAR	39.08**	100.0	51.5	1.94**	1.000**
AA	RECIP	46.16**	93.9	54.7	1.72**	.960**
AY	RECIP	26.61**	87.9	57.8	1.52**	.922**
EW	LOG	15.05*	78.0	50.0	1.56**	.619**
PW	LOG	32.32**	85.5	57.7	1.48**	.779**
CL	LINEAR	15.98[b]	75.0	53.1	1.41**	.669**

[a] LOG, SQRT, and RECIP are abbreviations for logarithmic, square root, and reciprocal transformations, respectively.
[b] Significant at the .07 level.
[c] See footnote 16.
* Significant at the .05 level.
** Significant at the .01 level.

fitting functional form varies from firm to firm, the results are consistent in that each model represents a statistically significant improvement over the best fitting naive model (intercept only). Other association metrics presented in Table 3 confirm the model chi-square results. The Somers' *D*-statistic is significantly different from zero at the .01 level and the percentage of observations correctly classified by each model is significantly different (also at the .01 level) from that provided by chance.[16] The strength and consistency of the results lead to rejection of the first hypothesis. These results raise questions about the potential for additional information in auditors' interest-capitalization consistency exceptions since nine publicly available financial measures can capture the essence of the materiality decisions. For TR the results also question the need for "experienced human judgment" and the importance of subjective factors when making this type of materiality judgment.

Examination of Table 3 also reveals that the model/chance ratios, associated with the percentage of judgments classified correctly by the Big Eight firms' models, vary from a high of 1.94 (TR) to a low of 1.41 (CL). Furthermore, the Somers' *D*-statistics vary from a high of 1.000 (TR) to a low of .619 (EW). Although all of the Somers' *D*-statistics are significant at the .01 level, the wide range of values suggests that the logistic regression models' association with the actual auditor judgments may vary significantly across Big Eight firms.

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[16] Morrison [1969] has shown that, when one is interested in correctly classifying members of *both* groups in a dichotomous variable model, the proper chance criterion is the proportional chance criterion $[p^2+(1-p)^2]$ where p is the proportion of observations in group 1 and $1-p$ is the proportion of observations in group 2.

TABLE 4

BETWEEN-FIRM DIFFERENCES IN JUDGMENT CONSENSUS[a]

Audit Firm	*PMM*	*DHS*	*TR*	*AA*	*AY*	*EW*	*PW*	*CL*
	Differences in Somers' D							
PMM	—							
DHS	.036	—						
TR	.031	.067	—					
AA	.009	.027	.040	—				
AY	.047	.011	.078	.038	—			
EW	.350**	.314**	.381**	.341**	.303**	—		
PW	.190**	.154*	.221**	.181**	.143	.160	—	
CL	.300**	.264*	.331**	.291**	.253*	.050	.110	—

[a] The test utilized in this table calculated the variance according to the following formula:

$$\text{Var } D = \frac{5(1-D^2)}{9(n-1)}$$

where

$D = c - d$ = an index of rank correlation,
c = number of pairs of observations in which the predicted probabilities are concordant with the dependent variable values, and
d = number of discordant pairs.

Kendall [1975] has shown that the Var $D \leq \frac{5(1-D^2)}{9(n-1)}$ for $n \geq 10$, suggesting that the tests are on the safe side in the sense that there is no danger of attributing significance to non-significant results, although in some cases it may fail to discern significance where it exists.

* Significant at the .05 level.
** Significant at the .01 level.

Hypothesis Two

To test the second hypothesis, differences in Somers' D values between individual Big Eight firms were calculated and are reported in Table 4. In 14 of the 28 two-firm comparisons, significant differences (at the .05 level) were found in the association metrics leading to rejection of the second hypothesis. Three firms (EW, PW, and CL) account for all of the significant differences and all three firms ranked lowest in terms of association metrics. These firms' Somers' D values (Table 3) were at least 14 percentage points lower than the nearest of the other five Big Eight firms.

The results reported in Table 4 also suggest that there may be some relation between the logit models' association with actual auditor judgments and the degree of audit firm structure. All tables list the Big Eight firms in descending order of audit structure. Therefore, if a positive relation exists between Somers' D and structure, one would expect to find declining association metrics in Table 3 and significant differences in the lower left portion of Table 4. In addition, since PMM, DHS, TR, and AA are ranked first through fourth in terms of audit structure and first through fourth in terms of association metrics, it appears that firms providing more formal guidance to their auditors (structured firms) are better able to capture the

TABLE 5

CORRECT CLASSIFICATION PERCENTAGE BY AUDIT FIRM AND BY MATERIALITY JUDGMENT

		Cases Judged Immaterial by Auditor			*Cases Judged Material by Auditor*		
Audit Firm	*Form of Model*	n	*Number of Cases that Disagree with Model*	*Percentage Correctly Classified by Model*	n	*Number of Cases that Disagree with Model*	*Percentage Correctly Classified by Model*
PMM	LOG	30	1	96.7	12	1	91.7
DHS	SQRT	16	2	87.5	15	1	93.3
TR	LINEAR	12	0	100.0	17	0	100.0
AA	RECIP	32	2	93.8	17	1	94.1
AY	RECIP	23	2	91.3	10	2	80.0
EW	LOG	21	4	81.0	20	5	75.0
PW	LOG	48	3	93.8	21	7	66.7
CL	LINEAR	25	3	88.0	15	7	53.3

judgments of their personnel using a quantitative model. Since the logit models are measures of central tendency and since publicly available financial measures capture the essence of the materiality decision, it can be argued that structured audit firms have been able to attain more judgment consensus (less overlap and misclassification) than unstructured firms. More direct tests of the association between judgment and audit firm structure (H_3) follow.

Hypothesis Three

To test hypothesis three, we computed rank correlations between the Big Eight firms' structure measures and the association metrics of Table 3, including the model/chance ratio and the Somers' *D*. The Kendall rank correlation coefficient between structure and the model/chance classification ratio is .72 and significant at the .01 level. The correlation coefficient between structure and the Somers' *D* is .57 and significant at the .05 level. These positive and significant correlations suggest that the logit models of the structured audit firms better fit the data. On the average, structured firms exhibit less misclassification, more agreement between the objective materiality-based model and auditor judgments, and more judgment consensus. The strength and consistency of these results lead to rejection of the third hypothesis.

The percentage of observations classified correctly according to the model by each Big Eight firm provides an opportunity for investigating the possible costs of misjudgments. Specifically, an auditor who erroneously issues a consistency exception to clients whose interest capitalized is immaterial (a Type I error), may lose those clients. On the other hand, erroneously issuing an unqualified opinion when material inconsistencies exist (a Type II error) may lead to litigation and unfavorable publicity.

Cases classified correctly, by type of judgment, are presented in Table 5. For all Big Eight firms, the left columns show a high level of agreement between the cases judged immaterial by the auditor and the models' classifications. However, the cases judged material by the auditors (right columns) appear to be more difficult for the less structured audit firms' models to classify.

To further explain the results for H_3, rank correlations were computed for audit firm structure and the more detailed classification measures of Table 5. The correlation between structure and the percentage of immaterial judgments correctly classified is .23 and insignificant. However, the Kendall rank correlation coefficient between structure and the percentage of material judgments correctly classified is .64 and significant at the .05 level.

If auditor judgments are correct, then the logit model simply fits a quantitative model to the data. By not explicitly incorporating loss functions, the logit model infers a symmetrical loss function (see Kida [1980] and Lewis [1980]) and minimizes the total number of misclassifications. For the less structured Big Eight firms, this scenario suggests that the models suffer more Type II errors with the less structured audit firms having two to seven times the number of misclassifications (i.e., disagreements between model classification and actual auditor judgment) as the structured firms (see Table 5). With prior expectations suggesting no difference in model performance across Big Eight firms, this scenario suggests either poorer models or less consistent decisions for the unstructured audit firms. If the models are classifying correctly and the auditors are making incorrect judgments, the Table 5 results suggest that Type I errors predominate for the less structured CPA firms. It is as if the auditors from these firms are systematically trying to avoid Type II errors.

Regardless of whether the auditors or the models of auditors are more nearly correct, the results reported in Table 5 suggest that the materiality judgments associated with the less structured firms have less consensus, more misclassification, and more Type I and Type II errors. Compared to unstructured CPA firms, structured firms apparently incur lower total costs due to judgment differences.

Sensitivity Analyses

Since income near zero inflates the IC/NI ratio, between-firm comparisons could be somewhat distorted if such ratios are concentrated by audit firm. Therefore, all models were reestimated after eliminating observations with low reported income. Eliminating observations with the absolute value of income less than $100,000 (three firms) and again with the absolute value of income less than $500,000 (18 firms) did not significantly affect the model/chance ratios, the Somers' *D* values, or the strength of the correlation between audit firm structure and the two association metrics.

Another problem arises with the IC/NI variable when income is less than zero. The absolute value of this measure was used in all the results reported previously. Recognizing the possibility that materiality judgment decision models may not be symmetrical for firms reporting losses, the logit models were reestimated excluding the 21 firms. This modification, once again, did not significantly affect the model/chance ratios, the Somers' *D* values, or the strength of the correlation between audit firm structure and the Somers' *D* metric. However, the statistical significance of the correlation between audit firm structure and the model/chance ratio declined to the .08 level.

Since the numerator of IC/NI is on a before-tax basis, the denominator was redefined as income before tax. The logistic regression models were reestimated with this redefined NI and the results yielded nearly identical model/chance ratios, Somers' *D* values, and correlation coefficients between audit firm structure and the two association metrics.

One additional sensitivity analysis was conducted. For each Big Eight firm, the logit regression model was first fitted to the client-portfolio data, then the resulting model was tested on the same data. To see how well the logit models would perform out-of-sample, the model/chance ratios and Somers' *D* values were calculated using the Lachenbruch *U*-method [Altman et al., 1981]. This validation method focuses on the issue of classification errors versus coefficient stability. For a CPA firm with *n* materiality judgments, the *U*-method holds out one judgment at a time, estimates the logit model on the $n-1$ remaining judgments, then classifies the holdout judgment. This process is repeated until all the judgments are classified. As expected, the *U*-method reduced the model/chance ratios and Somers' *D* values for all the Big Eight firm models; however, both of these association metrics remained correlated, at the .05 level, with the audit firm structure measures. Collectively, these sensitivity tests suggest that the reported results are not likely an artifact of our research design.

SUMMARY AND CONCLUSIONS

This study examined the relation between publicly available financial information and auditor materiality judgments regarding interest-capitalization consistency opinions. Rule-making bodies have been reluctant to provide quantitative materiality guidelines because of the perceived level of experienced human judgment required for these types of decisions [FASB, 1980, par. 131]. This research has explored the extent to which consistency exception decisions can be quantified and investigates the level of consensus associated with individual Big Eight firms' inferred materiality judgment models.

Results suggest that nine publicly available financial measures explain a significant portion of the variability in auditor materiality judgments. The logit models of individual Big Eight firms correctly classified between 75 percent and 100 percent of the actual materiality judgments. For some of these CPA firms, there appears to be negligible potential for information in their interest-capitalization consistency opinions.

Although significant in each firm, the judgment consensus of consistency exception decisions was found to vary between individual Big Eight firms. Not only were significant differences in judgment consensus found between firms, but a significant positive association was found between audit judgment consensus and the degree of audit firm structure, thereby providing empirical evidence that audit structure may influence audit judgment. Materiality decisions of structured CPA firms were modeled more successfully, implying more consensus, fewer Type I and Type II errors in total and, thus, lower total costs due to judgment error than for unstructured firms.

Since significant differences were found between Big Eight firms and since those differences are partially explained by audit firm structure, future audit judgment researchers should exercise care when selecting individual auditors for behavioral experiments or audit firms for archival research. Consistent with Kinney's [1986] recommendation, our study suggests that future research should consider or control for the effects of CPA firms' structural preferences.

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The Effects of Auditor Change on Audit Fees: Tests of Price Cutting and Price Recovery

Daniel T. Simon and Jere R. Francis

ABSTRACT: The *Commission on Auditors' Responsibilities* expressed concern for the adverse effect of audit fee price cutting on auditor independence. In the present study, tests were conducted to determine both the presence and magnitude of audit fee price cutting on 1984 audit fees for a sample of 214 firms having changed auditors over the period 1979-1984. A *control* sample of 226 firms not changing auditors over the same period was used in order to estimate price cutting. Results indicated a significant fee reduction in the initial engagement year that averaged 24 percent of normal fee levels for ongoing engagements, an average fee reduction of 15 percent for each of the next two years, but by the fourth year of the new auditor the fee had increased to normal levels for continuing engagements. The *Commission*'s concern for price cutting's effect on auditor independence is then reconsidered in the context of recent work on the psychology of sunk costs.

THE objectives of this study are: (1) to determine if price cutting systematically occurs on initial audit engagements; and (2) if it does, to determine when audit fees recover or return to "normal" levels. Motivation for this study comes from the *Commission on Auditors' Responsibilities'* strong statement that price cutting is a direct threat to auditor independence:

> There are allegations, however, that firms sometimes offer relatively low fees for the first year or the first few years of an audit, with the expectation of recovering the initial loss in subsequent years. An ethics ruling [No. 52] of the AICPA indicates that when the preceding year's audit fee remains unpaid, independence is impaired. This prohibition is based on the belief that such a receivable from the client gives the auditor an interest in the financial success of the client. . . . We believe that accepting an audit engagement with the expectation of offsetting early losses or lower revenues with fees to be charged in future audits creates the same condition and represents the same threat to independence. [AICPA, 1978, p. 121]

The *Commission*'s concern about auditor independence is valid only if price

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Daniel T. Simon is Associate Professor, Indiana University Northwest, and Jere R. Francis is Associate Professor, University of Iowa.

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cutting actually occurs and if it is significant in amount. That is, substantial price cutting is a necessary though not sufficient condition for an independence problem to exist. The question of whether independence is actually impaired by such price cutting is beyond the scope of the study. However, implications of price cutting for auditor independence are considered in light of recent work on the psychology of sunk costs.

In spite of the public-policy concern for the consequence of price cutting on auditor independence, there is only anecdotal evidence that it is a widespread practice [AICPA, 1978; Keefe, 1985; Stevens, 1985; and *Wall Street Journal*, 1985a, 1985b]. Prior empirical studies have either failed to detect price cutting [Francis, 1984; Palmrose, 1986a; and Simunic, 1980] or cannot be generalized due to very small sample sizes [Baber et al., 1986; and Francis and Simon, 1987]. Francis [1984] tests for price cutting on a sample of 26 new engagements in the Australian market in two ways: (1) comparison with the prior year's fee; and (2) comparison with a predicted fee estimated by a cross-sectional audit fee model of continuing audit engagements. There is no indication of price cutting in either the initial year or subsequent years.

Simunic [1980] and Rubin [1987] indirectly test for price cutting by including an auditor tenure variable for "years on the engagement" in their cross-sectional audit fee models. If price cutting occurs, then, *ceteris paribus*, auditor tenure should be inversely related to audit fees. The auditor tenure variable is insignificant in Simunic's study; however, Rubin reports significant results for a sample of municipal audits. Palmrose [1986a, fn. 4] tests directly for price cutting on initial engagements by including a dummy variable coded one for initial engagements (six percent of the sample) in her cross-sectional audit fee model. The estimated coefficient is insignificant. However, Francis and Simon [1987] use the same procedure for 12 initial engagements (out of a total sample of 220) and report significant price cutting. Baber et al. [1986] also find evidence of price cutting on initial audits of 35 municipalities in North Carolina. Overall, the research evidence on price cutting is inconclusive in spite of the widespread allegation that it is a common practice.[1]

Prior empirical research on price cutting is extended in this study in two important ways. First, a large sample of 214 public companies changing auditors over the period 1979–1984 is tested along with 226 control firms not changing auditors over the same period. Second, the presence of price cutting is tested for the second through sixth years as well as the initial engagement year. The purpose of this test is to determine if price cutting persists beyond the initial year, and if so, to determine when the audit fee returns to the normal (control sample) level for a continuing engagement. Recall the *Commission on Auditors' Responsibilities'* assertion that lower initial fees may occur in the first year or first few years with the expectation of recovering the initial loss in subsequent years.

Test results show an average discount of 24 percent in the initial engagement year and 15 percent for each of the next two years. By the fourth year, audit fees are not significantly different from normal levels for continuing engagements. These findings reinforce the concern expressed by the *Commission* in that systematic price cutting appears to occur, that it is of a substantial amount, and that it persists on average over several years. Implications for auditor independence are considered in the final section of the paper.

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[1] In a laboratory setting, Schatzburg [1987] was also able to induce price cutting in a test of DeAngelo's [1981] low balling model.

The remainder of the paper is organized as follows. Research design and sample selection are discussed in the next section. The second section reports the primary results. Tests for alternative explanations are reported in sections III and IV. The effect of price cutting on auditor independence is then reconsidered from the perspective of DeAngelo's [1981] low balling model and recent research into the psychology of sunk costs.

I. RESEARCH DESIGN AND SAMPLE SELECTION

The research approach is to regress audit fees on a set of explanatory variables which includes the experimental variable of interest, auditor tenure. The model is estimated with fiscal 1984 data using a cross-sectional sample of 440 publicly traded firms. The sample includes 214 firms that changed auditors during the period 1979–1984, and the remaining 226 firms that did not change auditors over this period are treated as control firms. Normal or continuing engagement audit fees are based on these 226 firms. It is also important to note that the AICPA's Code of Ethics was changed in 1978 to permit direct client solicitation. Thus, the time period of auditor changes used in study (1979–1984) represents a more overtly competitive environment than existed at the time of the *Commission on Auditors' Responsibilities'* [AICPA, 1978] report, and as a result, provides a relevant setting for the price cutting tests.

We characterize the audit fee regression model as a proxy for an unobservable audit production function by the use of publicly-available data pertaining to the firm and its auditor. With the exception of auditor tenure variables, the explanatory variables used are ones found to be significantly and positively related to audit fees in other studies [Francis, 1984; Francis and Simon, 1987; Francis and Stokes, 1986; Maher et al., 1986; Palmrose, 1986a; Simon, 1985; and Simunic, 1980, 1984]. These variables proxy for auditee size, audit risk and complexity, and auditor size (generally, Big Eight vs. non-Big Eight). The cross-sectional variance explained by these models is quite high which increases the likelihood that the experimental variables of interest, auditor tenure in this study, do not proxy for correlated omitted variables.

The specific form of the audit fee regression model is the same as that used in Francis and Simon [1987]:

$$\begin{aligned} LOGFEE = b_0 &+ b_1 LOGASSETS \\ &+ b_2 SQSUBS \\ &+ b_3 FOREIGN \\ &+ b_4 INVREC \\ &+ b_5 OPINION \\ &+ b_6 AUDITOR \\ &+ b_7 CNGAUD + u \end{aligned}$$

where the dependent variable is the natural logarithm of audit fee and the explanatory variables are:

LOGASSETS = natural logarithm of total assets,
SQSUBS = square root of the number of consolidated subsidiaries,
FOREIGN = the proportion of foreign subsidiaries to total subsidiaries,
INVREC = the proportion of assets in inventories and receivables,
OPINION = an indicator variable having a value of 1 if the firm received a "subject to" audit opinion,

AUDITOR = an indicator variable having a value of 1 if the auditor is one of the Big Eight,

CNGAUD = three indicator variables representing auditor tenure as explained below,

u = a residual error term assumed, subject to subsequent testing, to have properties making OLS regression appropriate.

The first five explanatory variables are related to auditee size (*LOGASSETS*), audit complexity (*SQSUBS* and *FOREIGN*) and audit risk (*INVREC* and *OPINION*). Following earlier studies, these variables are expected to be positively related to audit fees (see Simunic [1980] and Francis [1984] for a discussion of the relation between these variables and audit fees). The sixth explanatory variable, *AUDITOR*, controls for the findings of recent studies of the U.S. audit market [Palmrose, 1986a and Francis and Simon, 1987] that Big Eight auditors receive premium audit fees.

The seventh explanatory variable, *CNGAUD*, is the variable of primary interest and allows tests of whether, after controlling for other variables, there is differential pricing of new audit engagements. Three separate *CNGAUD* variables are tested: *CNGAUD84* represents an initial audit engagement in 1984, *CNGAUD82-83* represents a second or third year engagement as of 1984, and *CNGAUD79-81* represents a fourth through sixth year engagement as of 1984. This allows subperiod analyses of the price cutting period and subsequent price recovery.

Data on audit fees for firms changing auditors were gathered by questionnaires. The fourth through sixteenth editions of *Who Audits America* (Data Financial Press) were used to identify firms that changed auditors between 1979 and 1984 *and* for which financial statement data would be available in public sources (Moody's manuals, the Disclosure Inc. file, or the Q-Data file). Of the 934 firms to which questionnaires were sent, 223 returned usable responses on their 1984 audit fees, a response rate of 24 percent. These responses were combined with 217 public companies for fiscal 1984 from the combined samples of Simon [1985] and Francis and Simon [1987]. This resulted in a final sample of 440 companies, 226 of which did not change auditors and 214 which did change auditors over the period 1979–1984.[2]

Annual reports and forms 10-K in the Disclosure Inc. or Q-Data files, and the Moody's Industrial or OTC manuals were used to confirm the year of the auditor change and to obtain information on the other explanatory variables. It was ascertained that there was a change in audit firm (as opposed to merely a change in auditor name due to mergers of audit firms) and to verify the date of a first engagement by a subsequent auditor which did not always correspond to the date of filing of SEC form 8K reported in *Who Audits America*.

II. Results

The final sample consisted of 440 observations for fiscal 1984. For 60 firms, 1984 represented an initial audit engagement. One hundred fifty-four

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[2] Several of the 223 firms were discovered not to have changed auditors when financial statements were examined, and there were a number of auditor changes from the combined samples of Simon [1985] and Francis and Simon [1987]. For these reasons the final composition of the sample was 214 companies changing auditors and 226 companies not changing auditors.

TABLE 1
AUDITOR CHANGES IN SAMPLE BY YEAR

First Year Audited by Current Auditor was:	*Number*	*Percent of Total Sample*
1984	60	13.5
1983	36	8.2
1982	43	9.8
1981	29	6.6
1980	29	6.6
1979	17	3.9
No change in auditor, 1979–84	226	51.4
Total	440	100%

firms had engaged their current auditor between 1979 and 1983, and the remaining 226 firms had made no change in auditor during the period 1979–1984. Table 1 summarizes the distribution of auditor tenure by year. The distribution of auditor changes in the sample was similar to that reported in *Who Audits America* which reported more than twice as many auditor changes in 1984 as compared to 1979. This trend toward increasing frequency of auditor changes in the 1980s is also noted in various issues of *Public Accounting Report* (e.g., January 1985).[3]

Descriptive statistics are reported in Table 2. Univariate tests (t-tests and Mann-Whitney U-tests) indicate no significant differences for the independent variables between firms that changed auditors in the six-year period 1979–1984 and the control firms. This indicates that results on the auditor change variables (*CNGAUD*) are not likely to be confounded by systematic differences in the other variables in the model.

The estimate of the 1984 cross-sectional model is reported in Table 3. The model has three auditor change indicator variables: one for the 60 initial engagements occurring in 1984, one for the 79 firms with initial engagements occurring in 1982–1983 (i.e., 1984 is a second or third year engagement), and one for the 75 firms with initial engagements occurring in 1979–1981. Grouping in this manner was done due to the smaller number of yearly auditor changes from 1979 to 1983 (see Table 1).[4]

The model's estimated coefficients are significant and explain a large portion of the variance of the dependent variable (adjusted R^2 is .79). Each control variable is significant at the .05 level or less. Regression assumptions of normally distributed residuals and constant variance are not violated.[5] In general, then, the

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[3] As a formal test to assure that the sample of auditor changes is representative across the period 1979–1984, we took the *total* number of changes reported in *Who Audits America* and developed an expected distribution, by year, for the sample of 214 auditor changes. A chi-square test showed that the null hypothesis of no difference could not be rejected at $p<.10$.

[4] The model was also estimated with a separate dummy variable for each of the six years. These results are generally consistent with those reported in Table 3. The parameter value converges on zero (though not strictly monotonically) over the six-year period and is insignificant for 1979 through 1981.

[5] A null hypothesis that the residuals were normally distributed could not be rejected at $\alpha=.05$ using a chi-square test. The text suggested by Goldfeld and Quandt [1965] was used to test for heteroscedasticity. The regres-

TABLE 2
1984 DESCRIPTIVE STATISTICS
($n=440$)

Variable	*440 Firms in Total Sample Mean (Std. Dev.)*	*214 Firms Changing Auditors 1979–1984 Mean (Std. Dev.)*	*226 Firms Not Changing Auditors Mean (Std. Dev.)*
Audit Fee ($thousands)	83.5 (106.7)	75.7 (113.9)	90.9 (99.1)
Assets ($millions)	69.7 (180.3)	69.6 (224.6)	69.7 (125.2)
Subsidiaries	3.7 (5.3)	3.4 (4.8)	3.9 (5.8)
Foreign	.12 (.22)	.10 (.19)	.14 (.24)
Proportion of Assets in Inventory and Receivables	.40 (.24)	.41 (.24)	.38 (.24)
Percentage of Firms:			
Receiving a Qualified Opinion	13%	15%	11%
Audited by:			
Big Eight Firms	66%	69%	63%
Other Firms	37%	31%	36%

model appears to be well specified. Pairwise Pearson product-moment correlations are reported in Table 4. The bivariate correlations are only of interest with respect to the experimental *CNGAUD* variables because of possible collinearity. Auditee size is the only control variable significantly correlated with any of the *CNGAUD* variables. While the correlations between auditee size and the *CNGAUD* variables are not very high ($R<.2$ in all cases), further tests reported in section III indicate that auditee size does not affect the test results. Thus, there is no indication of a collinearity problem in the data.

The auditor change variable for initial (1984) engagements has the predicted negative coefficient and is significant at the .01 level. The second auditor change variable representing 1982–1983 initial engagements is also negative and significant at the .02 level. Finally, the third auditor change variable for initial audit engagements occurring in 1979–1981 is not significantly different from zero. These results suggest that price cutting or discounting occurs in the initial year, continues for the next two years, but that in years four through six (the next three years), there are no significant fee differences compared to firms in the sample not changing auditors over the period 1979–1984.

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sion model was estimated on the upper and lower 40 percent of the sample based upon the predicted value of the dependent variable. An F-test for differences in the sum of squared errors was not significantly different from zero, indicating that the assumption of homoscedasticity was not violated.

TABLE 3

DEPENDENT VARIABLE AUDIT FEE MODEL ESTIMATE IS NATURAL LOG OF THE 1984 AUDIT FEE
($n=440$)

Independent Variables	*Estimated Coefficients (t-statistics)*
INTERCEPT:	2.17
CONTROL VARIABLES:	
LOGASSETS[a]	.46 (26.40)*
SQSUBS	.11 (4.56)*
FOREIGN	.25 (2.18)**
INVREC	.33 (3.31)*
OPINION	.33 (4.65)*
AUDITOR	.15 (2.88)*
EXPERIMENTAL VARIABLES:	
CNGAUD84	−.27 (−3.78)*
CNGAUD82-83	−.16 (−2.61)**
CNGAUD79-81	−.06 (−0.92)
ADJUSTED R^2	.79
F-RATIO	179.7*

*(**) Significant at .01 (.025), one-tailed tests.

[a] *LOGASSETS*$=\ell n$(total assets)
SQSUBS=(number of consolidated subsidiaries)$^{1/2}$
FOREIGN=number of foreign subsidiaries/total number of subsidiaries
INVREC=(receivables+inventory)/total assets
OPINION=1 if auditee received an uncertainty qualified opinion
AUDITOR=1 for Big Eight firm
CNGAUDXX=1 if auditee changed auditor during year *XX*

The results in Table 3 are also consistent with predictions from DeAngelo's [1981] low balling model.[6] Price cutting is clearly a special case of low balling [Francis, 1984, fn. 10], but audit fee data alone is insufficient for anything other than an indirect test of low balling. The reason is that low balling can only be explicitly tested with proprietary data on audit costs and normal profit margins [Francis, 1984, fn. 5].

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[6] DeAngelo [1981] defines low balling as occurring when initial audit fees are less than the sum of audit start-up costs and normal profits.

Table 4
Pearson Product-Moment Correlations
($n=440$)

	LOGASSETS	SQSUBS	FOREIGN	INVREC	OPINION	BIG EIGHT	CNGAUD84	CNGAUD82-83	CHGAUD79-81
LOGASSETS[a]	1.00								
SQSUBS	.56*	1.00							
FOREIGN	.27*	.37*	1.00						
INVREC	.10	.17*	.20*	1.00					
OPINION	−.26*	−.11	−.06	−.06	1.00				
AUDITOR	.30*	.22*	.14*	−.02	−.05	1.00			
CNGAUD84	−.14*	−.09	−.06	−.05	.10	.01	1.00		
CNGAUD82-83	−.10	−.03	−.02	.01	.00	−.03	−.19*	1.00	
CNGAUD79-81	.06	.07	−.04	.10	.01	.08	−.18*	−.21*	1.00

* = significant at .01.

[a] Definitions are in Table 3.

Magnitude of the price cutting can be inferred from the parameter estimates on the auditor change variables. A downward intercept shift occurs for the significant *CNGAUD* indicator variables. Thus, the *CNGAUD* parameter values can be used to calculate both mean fee reductions (the downward intercept shift) and a 95 percent confidence interval around the mean shifts.[7]

The mean fee reduction in the year of initial engagement is 24 percent with a 95 percent confidence interval of 13 percent to 34 percent. This result is comparable to the 20 percent average fee reduction reported by Baber et al. [1986] in a study of municipal audits in North Carolina. The magnitude of initial engagement price cutting is also consistent with anecdotal evidence. For example, the *Public Accounting Report* claims that typical fee reductions for initial audit engagements are in the ten percent to 30 percent range, with reductions in excess of 30 percent not uncommon (cited in Keefe [1985]). For the second and third years, the fee reduction is less, with a mean of only 15 percent and a 95 percent confidence interval of four percent to 25 percent. No estimate is made of years four through six since the parameter value is not significantly different from zero.

The procedure can be also used to estimate the magnitude of Big Eight fee premiums. Based on the estimated parameter for the Big Eight indicator variable in Table 3, the average fee premium is 16.2 percent. The 95 percent confidence interval range is five percent to 28 percent. Using this same procedure, it is also possible to infer the magnitude of Big Eight premiums based on the reported coefficients in other studies. The Big Eight premium averaged 16.5 percent in Francis [1984], 18.8 percent in Francis and Stokes [1986], 16.6 percent in Palmrose [1986a] (for the nonutilities in the sample), and 18.3 percent in Rubin [1987]. Thus, the magnitude of Big Eight audit fee premiums is quite consistent on an interstudy basis across both countries and the public/private sectors.

III. TESTS FOR ALTERNATIVE EXPLANATIONS

There are many reasons why auditor changes may occur [Bedingfield and Loeb, 1974; Burton and Roberts, 1967; and Eichenseher and Shields, 1983]. Some of the reasons include industry specialization [Danos and Eichenseher, 1982], client financial distress [Schwartz and Menon, 1985], auditor-client disagreements [Chow and Rice, 1982; and Smith, 1986], agency costs and auditor reputations [Eichenseher and Shields, 1986; Francis and Wilson, 1987; Palmrose, 1985; and Simunic and Stein, 1986], auditor mergers [Healy and Lys, 1986], economies of scale, and other production reasons [Danos and Eichenseher, 1986; Dopuch and Simunic, 1980 and 1982; and Johnson and Lys, 1986].

Some of the above explanations suggest that auditor switches may occur for technological reasons to obtain a more efficient auditor. If this is the case, the price cutting results reported in Table 3

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[7] The shift in the intercept affects audit fees in the fitted model in the following manner:

$$\frac{e^x - e^{(x-z)}}{e^x}$$

where

e^x = audit fees for firms *not* changing auditors,
$e^{(x-z)}$ = audit fees for firms that changed auditors where z is the downward shift in the intercept due to *CNGAUD* variable.

The above equation can be simplified to

$$1 - \frac{1}{e^z}$$

which is then solved using the mean parameter value (z) of the auditor change variable. A 95 percent confidence interval is calculated using values of $\pm 1.96(z)$ in the above equation.

might merely reflect an efficiency gain rather than a discount from a normal fee. (Of course, if this were true, it is not clear why subsequent audit fees rise to average levels by the fourth year.) Alternatively, some auditor switches may be motivated by auditor reputation. If a higher reputation auditor were used, then the effect of price cutting might be offset by larger audit fees since the brand name Big Eight firms appear to command fee premiums. Conversely, if a lower reputation auditor were used, then the presence of lower audit fees would not necessarily be due to price cutting behavior.

The potential confounding due to either technological or auditor reputation effects can be mitigated by limiting the sample to those firms switching to a similar auditor. For this purpose, three broad categories or classes of audit firms are used: Big Eight, other national firms (the so-called second tier), and local/regional firms.[8] The model in Table 3 is reestimated using only observations on *same-tier* auditor changes: Big Eight to Big Eight, other national to other national, and local/regional to local/regional. The rationale is that such parallel auditor changes are less likely to occur for either technological or reputation-related reasons, in which case one is less likely to observe audit fee differences due to significant technological or reputation differences between the two audit firms.

This procedure resulted in a reduced sample of 315 firms, 89 firms which had made same-tier auditor changes between 1979 and 1984 and the 226 control firms. The results of estimating the regression equation on this reduced sample were similar to those reported for the full sample in Table 3. Significantly lower fees were indicated for firms changing auditors from 1982–1984 and there were no significant difference between fees paid by the control firms and the firms changing auditors from 1979–1981.

As another way of assuring that auditor type was not a confounding variable, the regression model was estimated separately for the 290 audits performed by Big Eight firms and the 150 audits performed by non-Big Eight firms. Again, results for each of these partitions of the sample were similar to those for the full sample which indicates that *both* Big Eight and non-Big Eight firms engage in comparable price cutting behavior.

These tests on subsamples of the data suggest that the results are not being driven by firms which had technological or reputational reasons for changing auditors and, thereby, incurring audit fees different from those paid by the control group. Therefore, it can be argued that the results are more consistent with price cutting on new engagements rather than with technological/reputational reasons for different fees on new audits.

Another possible confounding variable considered was the type of audit opinion McConnell [1983] reports that firms changing auditors are more likely to receive a qualified opinion. To obtain assurance that audit opinion was not biasing the results, the regression model was estimated after deleting all firms receiving a qualified opinion. This resulted in a reduced sample of 383 firms. The results for all variables, including the auditor change indicators were comparable to that of the full sample.

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[8] The Big Eight are: Arthur Andersen, Arthur Young, Coopers and Lybrand, Deloitte Haskins and Sells, Ernst and Whinney, Peat Marwick Mitchell, Price Waterhouse, and Touche Ross. The other national firms are: Alexander Grant (now Grant Thornton), Fox and Co. (who merged with Alexander Grant in 1985), KMG Main Hurdman (who merged with Peat Marwick Mitchell in 1987), Kenneth Leventhal, Laventhol and Horwath, McGladrey Hendrickson and Pullen, Oppenheim Appel Dixon, Panell Kerr Forster, and Seidman and Seidman.

Another motivation for an auditor change could be to obtain an auditor having a broader scope of services (see Simunic and Stein [1986] for a development of this argument). If true, observed price cutting behavior on audits might be compensated for by higher profits on other (nonaudit) services. In this scenario, the audit serves as a loss leader for other services. To test for this, the ratio of audit fees to nonaudit fees was compared between the 214 firms changing auditors and the 226 control firms not changing auditors over the period 1979–1984. The ratio was not significantly different between the two groups, which suggests that price cutting is not a vehicle for systematically larger nonaudit fees. Empirical results from Palmrose [1986b] and Simunic [1984] also refute the notion that audit fees are systematically lower as a function of increasing nonaudit fees. The model in Table 3 was also re-estimated with the natural log of nonaudit services included as an additional variable. It was insignificant and all other variables were unchanged.

IV. Tests for Model Misspecification Due to Auditee Size

If the functional form of regression model used in this study is misspecified, then it could be possible for cross-sectional differences among the independent variables to confound the auditor change variables even though the univariate tests indicated no significant differences between firms which changed auditors and firms which did not. In particular, auditee size could be a confounding variable (see Francis and Simon [1987]). McConnell [1983] presents evidence that firms changing auditors tend to be smaller than other firms. It is, therefore, possible that the auditor change variable reflects a residual auditee size effect (even though auditee size is a covariate in the model). Two tests indicate that this is an unlikely explanation for the results.

First, if auditee size is a confounding variable, an alternative specification of the model would be to deflate audit fee by auditee size (see Simunic [1980, 1984]) rather than including it as an indepen-dendent variable. When this alternative model was estimated the results were similar. Second, an *ex post* size-matched sample was created wherein firms having changed auditors in 1984 were matched with firms not having made an auditor change over the 1979–1984 period. The matching rule was that for each firm having switched auditors, there should be a comparably sized firm not having changed auditors (although not necessarily in the same industry), with a size match of within ten percent of total assets. This procedure resulted in a subsample of 104 firms (52 matches) with mean assets (standard deviation) of $44.7 ($142.1) million for firms which changed auditors and $45.2 ($144.0) million for firms which did not change auditors. The model was re-estimated for this subsample and the results were consistent with the full sample. The 1984 audit fee indicator was significant at the .01 level, indicating that firm size was not a confounding variable.

By relaxing the matching constraint to 15 percent of assets, a larger matched sample consisting of 152 firms changing auditors between 1979–1984 and 152 control firms was created. Mean assets (standard deviation) were $57.8 ($128.1) million for firms changing auditors and $58.2 ($128.1) million for the control firms. The results for this subsample of 304 firms paralleled those for the full sample: significantly lower 1984 audit fees for firms changing auditors from

1982-1984 and no significant difference for firms changing auditors from 1979-1981. Once again, this additional test indicates that auditee size is not a confounding variable.

V. PRICE CUTTING, SUNK COSTS, AND AUDITOR INDEPENDENCE

The analyses reported above strongly support the proposition that systematic price cutting behavior occurs, and that the observed price cutting is unlikely to be confounded by auditor technology, auditor reputation, nonaudit fees, or auditee size. Given the likely occurrence of systematic price cutting behavior by auditors, we return now to the question of its effect on auditor independence.

The *Commission on Auditors' Responsibilities* [AICPA, 1978, p. 121] explicitly stated its belief that price cutting has the potential to impair auditor independence in the same way as do unpaid prior years' audit fees. But it can be argued that the economic effects of both unpaid audit fees and price cutting, foregone profits and/or unrecouped out-of-pocket costs, are *sunk* in the past and, therefore, have no effect on subsequent behavior, i.e., the auditor's propensity to be independent [DeAngelo, 1981].[9] This is the traditional economic argument that sunk costs are irrelevant to subsequent rational decision making.[10]

Recent work on the psychology of sunk costs provides evidence that sunk costs *do* significantly affect subsequent decision making, contrary to predictions from economic theory. Arkes and Blummer [1985, p. 124] define the sunk cost effect as ". . . a greater tendency to continue an endeavor once an investment in money, effort, or time has been made. The prior investment, which is motivating the present decision to continue, does so despite the fact that it objectively should not influence the decision." In the audit context of price cutting, a considerable investment is made to obtain a new client. So the prior decision to discount the audit fee could motivate the auditor's desire to not lose the client, even in the presence of serious auditor-client disagreements. This desire to not lose the new client, because of the prior investment commitment, could lead to an additional auditor independence problem during the period of investment recovery, over and above normal independence problems.[11] That is, fear of losing the new client could compromise the auditor's objectivity in the presence of auditor-client disagreements, leading to resolution of disagreements in the client's favor.

Thaler [1980] suggests that the origin

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[9] DeAngelo [1981, p. 123] asserts that because low balling is a sunk cost, it has no subsequent effect, in and of itself, on auditor independence. However, DeAngelo maintains that there is an inherent auditor independence problem that arises from audit start-up costs which gives incumbent auditors a technological (cost) advantage over competitors. The opportunity to earn future quasi-rents due to the cost advantage of incumbency results in low balling the initial audit fee. Once hired, new auditors have an incentive to retain their "incumbency" in order to realize future quasi-rents. This situation, *ceteris paribus*, may lessen the auditor's optimal amount of independence; but, causality runs from quasi-rents to low balling, not vice-versa, hence, low balling *per se* does not add to the independence problem created by the quasi-rents.

[10] If price cutting were merely used as a loss leader to jointly supply both audit and more profitable nonaudit services, then there might not necessarily be a loss or sunk cost associated with price cutting. However, as indicated earlier, the relative magnitude of nonaudit fees was the same for both the control firms and firms having switched auditors. In other words, there was no indication that firms switching auditors purchased higher than normal levels of nonaudit services over the first six engagement years. In addition, Simunic [1984] and Palmrose [1986b] report that audit fees actually increase as the magnitude of nonaudit fees increases. So, it is reasonable to believe that price cutting is not "made up" by abnormally higher nonaudit fees.

[11] In the context of DeAngelo's [1981] low balling model, this would mean that not only do quasi-rents create a potential independence problem, but that the low balling itself creates the potential for an additional independence problem over and above the quasi-rents.

of the sunk cost problem is partly explained by prospect theory (see Kahneman and Tversky [1979]). In particular, differential subjective values are placed on gains and losses, and there is a certainty effect in which gains are systematically overvalued and losses are undervalued.[12] In a price cutting context, prospect theory suggests that the auditor might overvalue the magnitude and certainty of future "normal" audit fees and underestimate losses related to independence impairment.

A further explanation of the sunk cost effect is suggested by the escalation of commitment literature (see Staw [1981] and Staw and Ross [1986]) in which, contrary to expectations, negative consequences actually increase or escalate the commitment to a prior course of action. In the audit context, an auditor-client disagreement could, thus, escalate the commitment to *keep* the new client (perhaps acquired because of the price cutting) which again might affect the auditor's propensity to resolve disagreements in the client's favor.

Thus, when considered in the context of audit fee price cutting, recent theoretical and empirical research on sunk cost reinforces the *Commission on Auditors' Responsibilities'* concern that price cutting may threaten auditor independence over and above other possible impairments. However, the marginal effect on auditor independence may be small (if it exists at all) compared to other built-in anti-independence factors [DeAngelo, 1981].

SUMMARY AND CONCLUSIONS

For a large sample of firms changing auditors there is evidence of a substantial audit fee discount in both the initial year and over the next two years. The results are robust across auditor types (Big Eight, other national firms, and local/regional firms) and auditee size and are not confounded by nonaudit fees. There is no indication of a significant price discount after three years, suggesting that audit fees have increased to normal levels by then. The magnitude of the discount averages 24 percent in the initial year but drops to 15 percent for the next two years. These estimates of fee reductions are likely to understate the actual discount since audit start-up costs are not considered in the analysis but are likely to be nonzero. Based on these tests, it appears that price cutting systematically occurs and is economically significant. These results are consistent with low balling predictions from DeAngelo [1981] and assertions in the financial press that price cutting occurs.

The results reinforce the *Commission on Auditors' Responsibilities'* [AICPA, 1978] concern for the potentially adverse effect of price cutting on auditor independence. However, material price cutting is a necessary but not sufficient condition for an auditor independence problem to exist. DeAngelo [1981], for example, argues that since price cutting is a *sunk* cost it should not affect subsequent auditor behavior according to economic theory. In contrast, work reported in the psychology literature provides evidence that sunk costs such as price cutting can influence subsequent decision making, contrary to predictions from economic theory. These findings suggest the possibility of reduced independence until the sunk cost (initial audit fee discount) is recovered. The results indicate that, on average, this time period would be in excess of three years.

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[12] The "prospect" of gains and losses is thought to be cognitively framed in different ways. Thus, prospect theory posits a utility function that is concave for gains and convex for losses and whose slope is steeper for losses than for gains. This is counter to traditional economic theory in which outcomes are typically characterized simply in terms of marginal wealth changes.

Two caveats are noted. First, the sample covers a limited time frame. Second, the audit fee model is only an approximation for an unobservable auditor production function. Subject to these limitations the results indicate the empirical regularity of initial engagement price cutting by both Big Eight and non-Big Eight auditors.

Finally, as a side-issue in the study, the magnitude of Big Eight audit fee premiums is also estimated. For this sample, the average premium is 16 percent with a range of five percent to 28 percent for the 95 percent confidence level.

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The Effects of Information Choice and Information Use on Analysts' Predictions of Municipal Bond Rating Changes

Barry L. Lewis, James M. Patton, and Sharon L. Green

ABSTRACT: The research reported here investigates the effects of information choice and information use on the quality of municipal financial analysts' predictions concerning changes in the general obligation bond ratings of cities. Analysts were given a menu from which they chose information; a statistical model of bond rating changes was constructed using the same information. Analysts predicted bond rating changes using either their self-selected information or information selected by the statistical model. Although previous research concluded that information choice was the main factor in humans' sub-optimal prediction achievement, the results in this study show that humans performed about as well as statistical models in a validation sample. Previous research was reinterpreted in light of the current results.

THERE is a long line of research concerning the predictive ability of financial accounting data. This research includes statistical models to predict corporate bankruptcy or default [Beaver, 1966; Altman, 1968; Deakin, 1972; and Ohlson, 1980] as well as models to classify firms according to various credit ratings [West, 1970; Kaplan and Urwitz, 1979; and Dietrich and Kaplan, 1982]. While these studies have been criticized for a lack of theory and for an *ad hoc* selection of independent variables, they have shown that a relatively small set of financial variables can produce fairly accurate predictions or classifications in the private enterprise setting.

The statistical studies cited above provided a foundation for an extended series of papers which examined the ability of financial analysts and loan officers to use the same kinds of data to predict corporate failure or default.

We are grateful for the cooperation of the National Federation of Municipal Analysts in the conduct of the research reported in this paper. We also acknowledge useful comments from the participants in Accounting Workshops at the University of Pittsburgh and the University of Michigan, particularly Marlys Lipe, Robert Lipe, Robert Libby, and Ian Zimmer.

Barry L. Lewis is Peat Marwick Professor of Accounting, University of Colorado. James M. Patton is Associate Professor of Business Administration, and Sharon L. Green is a Doctoral Student, both at University of Pittsburgh.

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Most of these studies (e.g., Libby [1975]; Casey [1980]; and Zimmer [1980]) required subjects to use a fixed profile of financial data to predict which firms in a sample would default or experience bankruptcy. Empirical results show that although subjects do far better than chance in making such predictions, their accuracy can be affected by both the diagnosticity of the data and whether the sample proportion of failed/non-failed firms is disclosed.

Although behavioral studies have provided some understanding of how loan officers or analysts use a given set of data, they have been criticized for overlooking the issue of whether the subjects are capable of choosing the best information with which to make judgments of financial condition [Einhorn, 1976]. Responding to this criticism, Abdel-khalik and El-Sheshai [1980] examined the impact of both information selection and information use on accuracy in an experimental task involving the prediction of corporate default. By allowing subjects to choose their own information from a data menu, Abdel-khalik and El-Sheshai were able to compare human prediction performance with: (a) the performance of the best statistical model derived from the data menu; and (b) the performance of the best statistical model based on the information items chosen by the subjects. Abdel-khalik and El-Sheshai concluded that information selection, not information use, was responsible for the sub-optimal performance by analysts predicting default of private enterprises.

Predictive ability research in the municipal setting has focused primarily on statistical analyses of municipal bond ratings and changes in bond ratings [Michel, 1977; Ingram and Copeland, 1982; and Marquette and Marquette, 1986]. This focus results from the fact that (since the 1930s) municipal bond defaults and bankruptcy have been very rare. Although suffering from many of the same conceptual problems as corporate predictive ability research, statistical predictive ability studies in the municipal setting have found that financial and demographic data can be combined to accurately classify cities into bond rating categories. However, the municipal bond rating studies have normally produced lower correct classification rates than those found in the corporate bond setting.

The research reported in this paper uses the general approach introduced by Abdel-khalik and El-Sheshai to investigate the issues of information selection and information use in a municipal context. The remainder of this paper is divided into three sections. Section I provides a brief statement of the research objectives and general research approach. Section II describes the specific research method used. The final section presents empirical results and compares them with those of Abdel-khalik and El-Sheshai [1980].

I. RESEARCH OBJECTIVES AND GENERAL RESEARCH APPROACH

The purpose of this research is to investigate the ability of analysts to select and use data to predict municipal bond rating changes and to explore some possible sources of prediction errors. Prediction errors by analysts could be caused by any combination of the following:

1. *Predictability.* The environment event (bond rating changes) may be difficult to predict due to randomness in the underlying event or due to insufficient information.
2. *Sample Proportion Information.* To the extent that sample propor-

TABLE 1

INFORMATION SELECTION × INFORMATION PROCESSING COMBINATIONS

Information Processed and Prediction Made by	*Information Selection*	
	By Analysts	*By Statistical Model*
Analyst	S_{HH}	S_{HM}
Model of Analyst	S_{MH}	S_{MM}
Environmental Model	S_{EH}	S_{EM}

where

S_{HH} are the actual predictions of analysts (humans) using self-selected information,
S_{MH} are the predictions made by a statistical model constructed to simulate the judgments of analysts using self-selected information,
S_{EH} are the predictions made by the best linear model that relates actual bond rating changes to the information selected by analysts,
S_{HM} are the actual predictions of analysts using the best statistical predictors,
S_{MM} are the predictions made by a statistical model constructed to simulate the judgments of analysts using the best statistical predictors, and
S_{EM} are the predictions made by the best linear model that relates actual bond rating changes to the best subset of five items appearing in the information menu.

tions of the event to be predicted are not representative of the environment, knowledge of those proportions may affect accuracy.

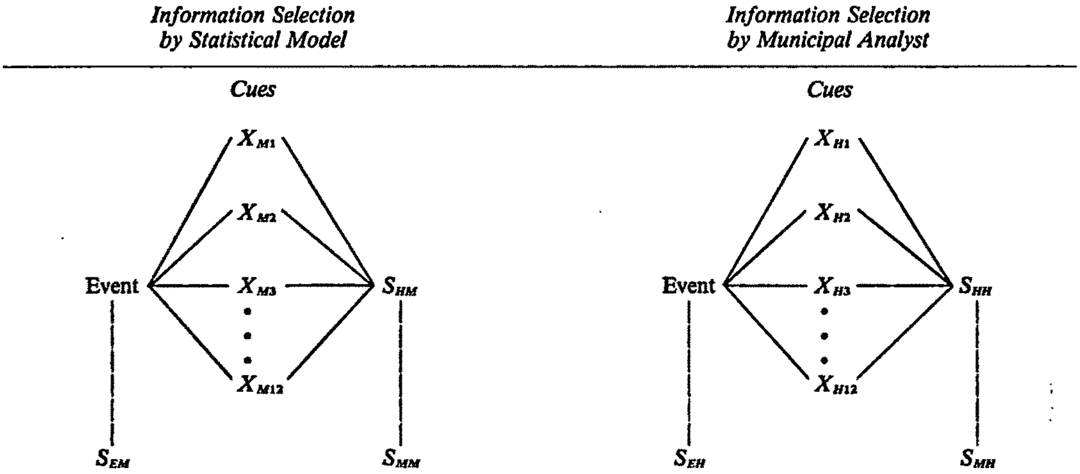
3. *Consistency.* Analysts may be inconsistent in application of their judgment process.
4. *Information Choice.* Analysts may not choose the best information from the data available to them.
5. *Information Use.* Analysts may not combine information in the best way.
6. *Sampling Error.* Relationships among variables for the experimental sample may not be representative of the analysts' experience with a broader sample of cities.

The research design allows assessment of each of these potential sources of prediction error. The general research approach follows the design of Abdel-khalik and El-Sheshai [1980]. We analyze each of the six different prediction strategies shown in Table 1. These six strategies result from crossing two information selection strategies with three information processing strategies. Specifically, information can be selected by the human subjects or by a statistical model. The three information processing strategies are: processing by human subjects; processing by statistical models which attempt to capture the underlying processes of the subjects; and processing by the best statistical model of the environment. As in Abdel-khalik and El-Sheshai, comparisons between pairs of the strategies are made on the basis of "hit" rates or the percentage of correct classifications.

The six prediction strategies described above are also translated into a lens model diagram in Figure 1. The left-hand side of Figure 1 represents a lens model in which the subset of information cues are chosen by a statistical model. The right-hand side represents a lens

FIGURE 1

LENS MODEL REPRESENTATION OF INFORMATION SELECTION × INFORMATION USE COMBINATIONS*



* See Table 1 for an explanation of the six S combinations.

model in which the subset of cues are selected by a human subject. From this pictorial representation, one can see the comparisons needed to assess the impact of the various sources of prediction error mentioned above. For example, the effect of information selection can be addressed by comparing S_{EH} with S_{EM}; these two strategies represent the diagnosticity of human-selected information and model-selected information, respectively. Similarly, information use issues can be addressed by comparing subjects' actual hit rates (S_{HH} and S_{HM}) with the highest hit rates that could be achieved with the same data (S_{EH} and S_{EM}). These and other comparisons based on actual data from the experiment are presented in section III. Note that Abdel-khalik and El-Sheshai were not able to calculate S_{HM} and S_{MM}.

II. RESEARCH METHOD

The research involved several distinct operational stages. First, we identified a sample of municipalities that included approximately equal proportions of increases, decreases, and no changes in general obligation debt ratings. Second, a data base that included a menu of 12 information items believed to be useful for the prediction of bond rating changes was constructed. Third, the linear combination of five of the information items which best classified the ratings in our sample of cities was determined. Fourth, subjects were asked to select the five items which they believed would be most useful in predicting bond rating changes. Fifth, subjects were provided with five information items and asked to classify the cities in the sample; half of the subjects received the items they had requested while the others received the five items which were the best statistical predictors. Sixth, the correct classification rates in each of the six cells of Table 1 were compared to trace the effects of information choice and information use. Finally, we tested the predictive ability of the statistical models on a large validation sample. Details concerning the conduct of the study are provided next while results are presented in section III.

Cities in the Sample

Sample cities were selected from municipalities that had had a stable A rating from Moody's for at least three years in the late 1970s to early 1980s. A-rated bonds were chosen because prior research has shown that there is some "stickiness" to bonds rated near the high and low ends of the bond rating scale [Marquette and Marquette, 1986]; i.e., Moody's seems to be reluctant to increase ratings to AAA and to reduce ratings below BAA, the lowest investment grade rating. Also, as A-rated bonds were used in a prior statistical study of municipal bond rating changes [Raman, 1981], the choice allows comparisons with prior research.

Recent issues of Moody's *Bond Survey* were reviewed to identify cities whose general obligation bond ratings went up or down after being a stable A for three or more years. Because we planned to rely on published Census Bureau data for some independent variables, the search was limited to cities with populations in excess of 50,000. A review of the *Bond Survey* from 1980 to 1984 revealed 17 such cities with general obligation bond rating changes from Moody's A (nine increased, eight decreased). All 17 were included in the sample. Eight more cities that maintained their stable A rating were randomly chosen from the same population. Thus, there were 25 cities in the sample to be evaluated by the analysts. Note that the approximately equal proportions of increasing, decreasing, and stable ratings in this study are not typical of bond rating changes. As prior behavioral research (e.g., Casey [1983]) has suggested that disclosure of sample proportions can be an important factor in prediction achievement, this characteristic was varied in this research.

Information Menu

The fiscal and socioeconomic variables used in three recent statistical studies of municipal bond rating changes [Raman, 1981; Copeland and Ingram, 1980; and Marquette and Marquette, 1986] and one study on municipal bond risk [Ingram, 1985] were reviewed to identify information items to present to the subjects. While these prior studies were not based on a theory of municipal financial analysis, our goal was simply to identify plausible information items to present to analysts. After eliminating duplicates, we identified 25 independent variables that had been used in prior studies.[1] This list of variables was reduced by half in order to: (1) ease the cognitive burden of subjects; and (2) reduce the statistical problems of multicollinearity. Five of the 25 variables were eliminated based on conceptual reasons or based on our belief that they would be too difficult to explain to subjects.[2]

A correlation matrix of the remaining 20 potential independent variables was constructed to identify any obvious multicollinearity problems remaining. This procedure led to the elimination of three more variables which were highly correlated with a number of other potential independent variables. Finally, a series of step-wise regressions were estimated using, in turn, each of the 17 remaining variables as the dependent variable and the other 16 as independent variables. These analyses revealed five more variables that were significantly related to subsets of the remaining variables. Elimination of these five reduced the data set to 12 independent variables for use in predicting bond rating changes. These variables (listed in Table 2) provide reasonable coverage of the fiscal (e.g., fiscal capacity, debt burden, revenue self-reliance, essential service expenditure requirements, and fiscal imbalance) and socioeconomic (e.g., employment and population features) variables used in prior studies. The reasonableness of this data set was further validated by estimating a regression[3] using all 12 independent variables on the menu to classify the cities in the sample. The model correctly classified 20 of the 25 cities and had an R^2 of 0.7.

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[1] Two of the original studies used factor analytic procedures to arrive at their data sets. We began with the reduced sets.

[2] None of the five variables eliminated in this step had exhibited major explanatory power in the prior statistical studies.

Subjects and Task

As municipalities use financial reporting practices that differ from those of private enterprises, and as municipal general obligation debt is backed by the full-faith and credit-taxing power of municipalities rather than by business operations or mortgage security interests, municipal credit analysis would seem to require specialized skills and experience. The National Federation of Municipal Analysts (NFMA) is a convenient source of expert subjects. NFMA has approximately 500 members nationally at about 200 separate firms/locations. To obtain as many subjects as possible, but to limit the possibility of interaction between subjects, we solicited participation from one person at each of the separate locations plus an additional person from each of 50 locations in which multiple memberships were indicated in the NFMA membership roster.[4]

In Stage One of this research, a package which included a 12-item information menu and a cover letter explaining the project was mailed to 250 NFMA members. Subjects were asked to choose the five pieces of information that they believed would be most useful in trying to predict municipal general obligation bond rating changes. The letter also told them that Stage Two of the project would require them to actually make such predictions. Subjects were assured that we realized more (or different) information might be desirable for such a task but that we were interested in which items within this particular set of 12 they thought might be useful. Also, subjects were asked to rank the selections in order of their usefulness. One hundred and seven of the 250 potential subjects responded to Stage One (42.8 percent).

For Stage Two of the research, booklets containing data profiles of the 25 cities in the sample were prepared. The booklets consisted of a page of instructions, five pages of data (five information items for each of five cities per page), and a page of demographic questions. City names were not revealed. Subjects were asked to classify each city into one of three categories; increase, decrease, or no change in the Moody's general obligation debt rating in the year subsequent to the publication of the data provided. All subjects were told that all cities had an A bond rating prior to the disclosure of the information provided

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[3] For ordinal measures of an underlying continuous dependent variable (credit-worthiness), *n*-chotomous probit would normally be used. However, for sample sizes of less than 50, regression has been shown to be a more valid procedure [Malhotra, 1983]. For that reason, regression has been used for all statistical modeling in this study.

[4] There were only two cases of multiple participants from the same firm/address in this study. The information requests and bond rating predictions of the same-address respondents did not exhibit any obvious collaboration by the analysts; e.g., they did not request identical or orthogonal data sets and their bond rating predictions were not identical.

TABLE 2

INFORMATION SELECTED BY ANALYSTS AND STATISTICAL MODEL

Rank Order Number	*Information Variable*	*Number of Times Chosen by Respondents (maximum possible =107)*	*Frequency of Importance Rank*				
	Description		*1st*	*2nd*	*3rd*	*4th*	*5th*
1†	General Revenue/General Expenditures (Current Year)	81	36	20	13	9	3
2†	General Obligation Debt/Population	76	25	8	15	15	13
3	Percentage Change in Population in the Last Five Years	74	12	6	17	14	25
4*	Short-Term Debt/General Revenues	61	5	12	15	11	18
5	General Revenue/General Expenditures (Prior Year)	59	4	22	14	11	8
6	Property Tax Revenue/Total General Revenue	39	2	8	9	12	8
7*	Tax Supported Debt/Total General Revenue	32	3	8	7	9	5
8*†	(General Revenues − Non-Capital General Expenditures)/Tax Supported Debt (Tax Supported Debt = Total Debt − Municipal Utility Debt)	27	11	5	4	4	3
9*†	Own Source General Revenue/Total General Revenue	27	5	7	2	5	8
10	Percentage of Local Employment in Industrial Sector	26	2	5	4	6	9
11*†	Expenditures for Vital Functions/Total General Expenditures (Vital Functions = Education, police, health, interest)	16	0	4	6	4	2
12	Population of City	12	2	2	0	4	4

* Indicates variable included in best linear model from the original sample.
† Indicates variable included in best linear model from the validation sample.

in the experiment. Half of the subjects received (for each city) the five items of information that they had selected in Stage One. The other subjects received the five pieces of information that had been selected by a statistical model. In both cases, the information items were labeled and defined for the subjects on each page of the booklet. Because prior research has shown that revelation of sample proportion can affect subject responses [Casey, 1983], half of the subjects were told that there was approximately an equal number of cities with an increase, decrease, and no change in bond rating. The remainder were told only that the sample proportion was not equal to the real-world proportion. Forty-seven of the 107 respondents from Stage One completed the second stage of the study (44 percent). Subjects receiving self-selected data responded more often (54 percent) than did those receiving the model-selected data (32 percent).

III. Results

The empirical results will be presented in two subsections. The information selected by the statistical model and the subjects is discussed first followed by an evaluation of the subjects' performance (predictive accuracy) and the sources of prediction error that were listed in section I.

Ranking of Information Items

Table 2 lists the information menu items in decreasing order of their popularity with the participant analysts. Table 2 clearly reveals a fair amount of consensus among the subjects concerning which pieces of information are useful for predicting bond rating changes; e.g., each of the top five items was chosen by over half of the 107 respondents. However, only a few subjects asked for exactly the same five variables.

The information items that were selected by the statistical model are marked with an asterisk in Table 2. There is little overlap between the five particular items most frequently chosen by the subjects and the five items chosen by the statistical model. In fact, four of the items in the statistical model rank among those considered to be least useful by the analysts. Only item four, the ratio of short-term debt to general revenues, was both chosen by the statistical model and ranked by the analysts as one of the top five information items.

Evaluating Human Performance

The correct classification hit rates achieved under each of the six prediction strategies applied to the sample of 25 cities are presented in Table 3. The average prediction achievement of the analysts is measured by S_{HH} for those using self-selected information and by S_{HM} for those using model-selected information. These hit rates (45 percent and 44 percent, respectively) are significantly ($p<0.001$) better than a random classification model that would achieve a hit rate of 0.33. On the other hand, the analysts' predictions were far from perfect. What follows is an analysis of the underlying sources of the analysts' prediction errors; the discussion is structured around the sources listed in section I.

1. Predictability. A general benchmark for human performance is the environmental predictability given all the information available. Table 3 shows that the best linear prediction model using any five of the items in the information menu (Strategy S_{EM}) yields a 60 percent hit rate. This measure serves as an upper limit for expectations about the analysts' prediction achievement. It is clear from Table 3 that the hit rates of

TABLE 3

PREDICTION ACCURACY OF VARIOUS INFORMATION SELECTION × INFORMATION STRATEGIES (ORIGINAL SAMPLE OF 25 CITIES)

Strategy	*Description*	*Hit Rate*
S_{HH}	Accuracy of analysts using self-selected information	0.45 (average) ($n=29$)
S_{MH}	Accuracy of a linear model of the analysts using self-selected information	0.42 (average)
S_{EH}	Accuracy of the best linear prediction model using analyst-selected information	0.45 (average)
S_{HM}	Accuracy of analysts using model-selected information	0.44 (average) ($n=18$)
S_{MM}	Accuracy of a linear model of the analysts using model-selected information	0.44 (average)
S_{EM}	Accuracy of the best linear prediction model using model-selected information	0.60

the other five strategies were well below this benchmark.

2. *Sample Proportion Information.* Correct classification hit rates did not differ as a result of analysts' knowing the approximate sample proportion of cities experiencing bond rating changes. A review of the data suggests that subjects without information about the sample proportions seem to have assumed an even split. They generally classified an equal number of cities into each category. This result is consistent with Abdel-khalik and Eli-Sheshai [1980].

3. *Consistency.* Table 3 also reveals that linear models were capable of simulating the analysts very well. A comparison of the average hit rates of S_{HH} (.45) with S_{MH} (.42) and of S_{HM} (.44) with S_{MM} (.44) show that they are nearly identical. This is an indication that the processes used by the analysts could be, on average, captured well by a linear model and that the analysts were relatively consistent.

4. *Information Choice.* The effect of information choice is measured by comparing the hit rate of prediction strategy S_{EM} with that of S_{EH}; each of these strategies reflects the maximum prediction achievement attainable, given the data available. Table 3 shows that S_{EM} (.60) produces a significantly better hit rate than that which can be obtained using analyst-selected data ($S_{EH}=.45$). Thus, it would appear that the selection of sub-optimal information contributed significantly to the analysts' prediction inaccuracy.

5. *Information Use.* One measure of the analysts' ability to use information effectively is a comparison of S_{HH} and S_{EH}. This measure compares an analyst's hit rate using self-selected data with the hit rate of the best statistical prediction model that could be constructed using those same analyst-selected cues. The data in Table 3 indicate that the analysts' average hit rate ($S_{HH}=.45$) was no worse than the statistical model's ($S_{EH}=.45$). This indicates that analysts performed about as well as they could have given the items of information they selected.

To this point, the results are generally consistent with the Abdel-khalik and El-Sheshai conclusion that information choice and not information use is the major cause of the analysts' prediction or classification errors. Abdel-khalik and El-Sheshai tied this conclusion to findings by Dawes and Corrigan [1974, p. 105] that indicate the "whole trick is to decide what variables to look at." However, if information choice were the only relevant factor, then one would also expect subjects receiving the model-selected data to perform more accurately than those who received self-selected data. Abdel-khalik and El-Sheshai were unable to make this comparison since none of their subjects received the model-selected information. A comparison of S_{HM} (.44) with S_{HH} (.45) from Table 3 indicates that municipal analysts who received model-selected data did no better than those who used self-selected information. Thus, information selection does not seem to fully explain the prediction errors.

6. Sampling Error. The statistical prediction models described above were based on the relations that existed within the specific sample of 25 cities used in this study. In contrast, one would expect that municipal analysts tend to base predictions on their *general* experience with financial statements and other information about municipalities. To the extent that the relations that the analysts have learned over time differ significantly from the specific relations in our limited sample, it would be logical to expect the analysts to be out-performed by statistical models.

One way to assess the external validity of a statistical model would be to use it to classify another sample. However, as noted earlier, the original sample comprised all cities changing from an A rating for the available time period. Therefore, we constructed a surrogate validation sample comprised of 74 cities (chosen from the same time period as the original sample) which consisted of roughly equal proportions of cities with stable A1 ratings (a grade above A), A ratings and either BAA or BAA1 ratings (a grade below A). The bond rating distribution in the validation sample matches the post-change bond rating distribution of the original sample of 25 cities. The task of classifying cities into these three (A, >A, <A) bond rating categories is believed to be similar to the task of detecting changes from a stable A bond rating.[5] Thus, this second, larger sample of cities was used to assess the external validity of the initial results.

The same 12 items of information were collected for the validation sample of cities that were collected for the original sample. Using this information, new prediction models were developed to test the predictive power of models from the original sample of 25 cities. Table 4 describes the various models tested and presents the correct classification hit rates in the validation sample for each model. Table 4 shows that the best statistical model based directly on this validation sample (Strategy $S_{E_VM_V}$ (V indicates validation sample)) correctly classified only 45 percent of the sample. This is significantly lower than the 60 percent result for the same strategy based on the original sample reported in Table 3 (i.e., $S_{E_OM_O}$). Apparently, the small number of observations in the experimental sample of 25 cities resulted in some overfitting of the best statistical model. This overfitting had the effect of inflating the benchmark prediction rate

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[5] Some analysts reported that they viewed the original bond rating change prediction task as judging whether the information profile of a given city was most consistent with an A bond or a bond below/above the A rating.

TABLE 4

PREDICTION ACCURACY OF VARIOUS INFORMATION SELECTION AND INFORMATION USE STRATEGIES (VALIDATION SAMPLE OF 74 CITIES)

*Strategy**	*Description*	*Hit Rate*
$S_{M_O H}$	Statistical model of analysts using self-selected information; regression weights derived from original sample.	.39 (average) ($n=29$)
$S_{E_V H}$	Best statistical predictor using analyst-selected information; regression weights derived from validation sample.	.41 (average) ($n=29$)
$S_{M_O M_O}$	Statistical model of analysts using model-selected information; regression weights derived from original sample.	.39 (average) ($n=18$)
$S_{E_O M_O}$	Best statistical predictor; information items and regression weights derived from original sample.	.41
$S_{E_V M_O}$	Best statistical predictor; information items from original sample; regression weights from validation sample.	.42
$S_{E_V M_V}$	Best statistical predictor; information items and regression weights both from validation sample.	.45

* *S* corresponds to the descriptions in Table 1, *O* refers to the original sample, and *V* the validation sample.

used to evaluate the municipal analysts' performance. The specific statistical model that correctly classified 60 percent of the cities in the original sample (Strategy $S_{E_O M_O}$) correctly classified only 41 percent of the validation sample. In fact, the best model using the five information items which were optimal in the original sample had a hit rate of only .42 (Strategy $S_{E_V M_O}$). In short, when the original statistical model was removed from its original environment, its predictive ability fell to the levels present in the other five cells of the research design.

We also used the validation sample to further analyze the effects of information choice on prediction accuracy. To do this, we first used analyst-selected data to predict bond ratings in the validation sample. On average, these models (Strategy $S_{E_O H}$) achieved a 41 percent hit rate. Comparing this with the validation sample statistical model benchmark of 45 percent ($S_{E_V M_V}$) reveals that analysts seem to be pretty good (but not optimal) at choosing information. Further support for this conclusion is provided in Table 2 which shows that the best statistical model for the validation sample included the two variables most often selected by the analysts.

Although the analysts in the study did not have an opportunity to predict bond ratings in the validation sample, the issue of information use can be examined by testing the predictive power of the models of the analysts which were constructed from the original sample. Table 4 shows that statistical models of analysts based on the original sample of cities and either self-selected information ($S_{M_O H}$) or model-selected information ($S_{M_O M_O}$) achieve average hit rates of 39 percent when applied to the validation sample. This rate can be compared to the best prediction models using the same cues ($S_{E_V H}=41$ percent; $S_{E_V M_O}=42$ percent) applied to the validation sample.

We interpret the above results as indicating that analysts use relatively stable models that have similar success across samples. In contrast, statistical models, which are often used as benchmarks against which human performance is evaluated, can be situation-specific. This mixture may lead researchers to underestimate the relative performance of analysts in behavioral predictive ability studies. After adjusting for the situation-specific advantage of statistical models, our results show fairly even performance by models and humans in selecting and using data to predict bond rating changes.

Abdel-khalik and El-Sheshai [1980] report, but do not emphasize, similar results. Specifically, they report that their statistical model achievement index drops from 90 percent accuracy to about 60 percent when applied to a validation sample [p. 335]. Comparing subjects' prediction achievement rates to the statistical model's validation sample hit rate seems to us to be more appropriate because the statistical model is deprived of its ability to exploit the special characteristics of a single sample—characteristics that are not likely to persist across samples. In such a comparison, the significant effect of information selection disappears and the gap in achievement rates of humans vs. models is reduced in *both* the Abdel-khalik and El-Sheshai private enterprise setting and in our municipal context.

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NOTES

The Economic Theory of Regulation: Evidence from the Uniform CPA Examination

S. David Young

ABSTRACT: The economic theory of regulation suggests that occupational licensing laws are enacted and administered to advance the interests of licensed practitioners. For example, grading standards on licensing examinations could be altered to protect incumbent practitioners from new competitors. This possibility is investigated with time series data of Uniform CPA Examination results for California and Illinois. The results indicate that when the exam was graded by the individual states, exam failure rates increased with downturns in economic activity (as measured by unemployment rates). However, the evidence shows no statistical relation between failure rates and economic activity in the years after each of the states adopted the AICPA's Advisory Grading Service.

STIGLER [1971] and Peltzman [1976] argue that the self-interest of regulators, industry groups, and professional groups is the primary motivator of regulatory legislation. Known as the "acquired" or "economic" theory of regulation, one of its testable implications is that occupational groups will be more eager and, therefore, more successful, in securing protection through regulation during recessions than during expansions in economic activity [Elzinga, 1980].[1] A corollary to this argument is the proposition that grading standards on licensing examinations will tend to increase during downturns in economic activity to protect incumbent licensees. This study considers whether grading standards on the Uniform Certified Public Accountant (CPA) examination are associated with changing economic conditions.

Occupational Licensing and Licensing Exams: An Overview

The "public interest" model of regulation assumes that laws are introduced for the benefit of the general public.

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[1] Put another way, the theory asserts that as markets contract, incumbent practitioners become more inclined to support regulatory schemes that protect their markets from increased competition.

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S. David Young is Assistant Professor of Accounting, Tulane University.

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However, public policy is also influenced by the political activity of competing interest groups. Naturally, each group takes positions and makes arguments that it regards as beneficial to itself. In the case of occupational licensure, these groups are usually composed of organizations representing members of a particular trade or profession.

Critics of the public interest model, therefore, contend that regulatory legislation is motivated by the economic self-interest of professional groups (see, for example, Stigler [1971, p. 3]). Their criticism stems largely from empirical and anecdotal evidence that has shown that consumers rarely engage in campaigns to license occupations. If the purpose of licensing were to improve the quality of service, one would expect consumers, who might be the prime beneficiaries, to promote licensure. On the contrary, licensing is systematically promoted by practitioners.

In contrast to the public-interest model, the "economic" model suggests that government behavior in democracies is determined by legislators who are seeking to maximize their chances of reelection by responding to political pressure from special interest groups who, in turn, are seeking to use their influence to maximize their economic welfare [Stigler, 1971, p. 12; and Peltzman, 1976, p. 214].

Consistent with the "economic" theory of regulation, some critics charge that in tough economic times grading standards on licensing tests have sometimes been altered to reduce the number of entrants [Rayack, 1976]. Rayack hypothesizd that failure rates on licensing exams tend to vary with the level of unemployment, a proxy for general economic conditions. Using data on skilled trades in New England, time series regressions were estimated with failure rates as the dependent variable and either national or industry-specific unemployment rates as the explanatory variable. Most of the regressions yielded statistically significant results, including several at the one percent level. This evidence suggests that licensing boards tend to fail a high percentage of licensing applicants during economic recessions, in order to reduce the flow of new entrants into the market and, thereby, strengthen the competitive position of those already licensed.

In another study of licensing exam manipulation, Maurizi [1974] hypothesized that state licensing boards would alter pass rates in response to an occupational "queue." As the queue grew larger, pass rates would decline. Maurizi defined the queue as the ratio of new applicants within a state to the number of incumbent practitioners. Cross-sectional data for 18 occupations, including public accounting, were obtained for 1940 and 1950.[2] For all occupations combined, the regression coefficient had the predicted sign and was significant at the one percent level for both 1940 and 1950 with R^2 of 0.13 and 0.14 for 1940 and 1950, respectively. For accountants, the coefficient was significant at the ten percent level with the predicted sign for 1940 and at the one percent level with the predicted sign for 1950. The R^2 was 0.07 for 1940 and 0.23 for 1950.

The CPA Exam

Charges of unreasonable grading standards were made almost from the institution of the first CPA examinations [Previts and Merino, 1979, p. 147]. During the period 1903-1908, Illinois passed only six of 111 examination candidates, while granting 98 certificates by waiver. In the early years of the New York exam, failure rates were usually above 90 percent. Only three of 156 candidates passed the 1916 exam. These results led to charges of inappropriate grading standards.

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[2] Fourteen states provided data for the 1940 CPA exam; 21 for 1950.

The American Institute of Accountants responded to critics of the CPA examination with two important reforms —the Uniform CPA Exam and the Advisory Grading Service (AGS). Although both reforms were initiated in 1917, acceptance among the various state accountancy boards was gradual.

The establishment of the AGS is particularly relevant to the question of inconsistent grading standards. The AGS, which is now used by all of the state accountancy boards, is a centrally controlled service of the AICPA responsible for grading the CPA examination. The AGS's objective is to grade all exams fairly and uniformly.[3] The AGS applies grading guides (prepared by the Institute's Examination Division, and approved by its Board of Examiners) and other oversight measures [AICPA, 1985, pp. 9–12]. Grading guides list the concepts tested by each question and the conditions under which credit will be given. The important point here is that the guides provide uniform standards to which all graders must adhere.

In setting its grading standards, the Institute assumes that the quality of candidates is fairly consistent from year to year.[4] Accordingly, adjustment points are added when only a small proportion of candidates earn a passing score. The result is that pass rates are reasonably constant from year to year, and have been since the 1960s.[5]

The AGS sends exam scores to the state boards, which are then responsible for notifying candidates. With only minor exceptions, the state boards report these grades verbatim to the examination candidates.[6] Today, the AGS requires all jurisdictions to sign a contract agreeing to report cases in which a passing grade is changed to a failing grade, or vice versa.

The CPAs who founded the Uniform CPA Examination and the AGS did so for three reasons [Bruschi and Ashworth, 1967, p. 82]: (1) to provide a fair and reasonable means of entering public accountancy; (2) to keep the control of professional standards in the profession; and (3) to develop a nationally uniform standard.

In establishing its policy on the CPA Exam, the AIA sought to make clear its intention to impose a national standard, but one that was fair and impartial: "The Institute hopes to embrace within its membership all qualified men, . . . and it is practically certain that the Board of Examiners will submit questions which any practicing accountant of ordinary ability and experience should be able to answer. *The object of the Institute is to admit the applicant whenever possible*" (emphasis added).[7]

It should be noted, of course, that the same economic forces that may have compelled state boards to alter grading standards may have induced similar behavior in the AGS. Whether the effect of the AGS was to end the alteration of grading standards in response to economic conditions (as the AICPA's policies would imply) or merely impose such practices on a national scale is

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[3] Fairly and uniformly means that grading standards are to be applied equally to all candidates.

[4] This assumption may not be correct if many candidates are motivated to enter the accounting profession because of changing economic conditions.

[5] Based on the author's conversation with James Blum, Director of Examinations for the AICPA.

[6] In its earliest days, however, the boards could choose to ignore the Service's reported scores at will, without reporting such deviations to the Institute.

[7] From a February 1917 *Journal of Accountancy* editorial, as cited in Bruschi and Ashworth [1967, p. 82].

TABLE 1

NUMBER OF CPA EXAM CANDIDATES, NUMBER OF FAILURES, AND NATIONAL UNEMPLOYMENT RATES 1919-1977

	Illinois			*California*				
Year	*Number of Candidates*	*Number of Failed Candidates*	*Percentage Change in Failure Rates*	*Number of Candidates*	*Number of Failed Candidates*	*Percentage Change in Failure Rate*	*NUR*	*Percentage Change in NUR*
1919	55	24		NA	NA		1.4%	
1920	100	59	35.3	NA	NA		5.2	271.4
1921	157	118	27.5	70	36		11.7	125.0
1922	222	130	−22.6	102	42	−19.8	6.7	−42.7
1923	340	246	23.5	160	43	−34.7	2.4	−64.2
1924	400	291	0.6	174	66	40.9	5.0	108.3
1925	234	190	11.5	189	98	36.9	3.2	−36.0
1926	294	249	4.3	209	92	−15.2	1.8	−43.8
1927	348	293	−0.5	239	135	28.4	3.3	83.3
1928	462	388	−0.2	285	164	1.8	4.2	27.3
1929	475	429	7.5	283	168	3.3	3.2	−23.8
1930	538	494	1.7	325	239	23.7	8.7	171.9
1931	521	447	−6.5	326	218	9.0	15.9	82.8
1932	536	472	2.7	291	183	−6.0	23.6	48.4
1933	498	461	5.1	245	175	13.5	24.9	5.5
1934	453	414	−1.2	235	152	−9.4	21.7	−12.9
1935	372	299	−12.0	249	185	14.8	20.1	−7.4
1936	463	388	4.2	296	218	−0.9	16.9	−15.9
1937	500	378	−9.7	326	250	4.2	14.3	−15.4
1938	612	512	10.7	390	274	−8.3	19.0	32.9
1939	605	507	0.1	426	286	−4.6	17.2	−9.5
1940	622	502	−3.6	319	200	−6.6	14.6	−15.1
1941	601	481	−0.8	339	230	8.1	9.9	−32.2
1942	656	536	2.1	320	199	−8.4	4.7	−52.5
1943	524	438	2.7	409	240	−5.5	1.9	−59.6
1944	546	467	1.9	282	184	11.1	1.2	−36.8
1945	561	442	−7.8	345	245	8.9	1.9	58.3
1946	623	467	−4.8	685	221	−54.6	3.9	105.3
1947	979	737	0.4	1,388	660	47.8	3.9	0.0
1948	1,141	878	2.3	2,296	1,353	23.7	3.8	−2.6
1949	1,451	1,181	5.7	3,140	1,852	0.2	5.9	55.3
1950	1,331	1,091	0.7	2,847	1,769	5.3	5.3	−10.2
1951	1,193	898	−8.1	2,476	1,468	−4.5	3.3	−37.7
1952	1,152	932	7.4	2,538	1,657	10.1	3.0	−9.1
1953	1,097	867	−2.3	2,433	1,622	2.1	2.9	−3.3
1954	1,043	945	2.5	2,445	1,760	7.9	5.5	89.7
1955	927	754	0.4	2,253	1,600	−1.4	4.4	−20.0
1956	976	767	−0.3	1,732	1,143	−7.0	4.1	−6.8
1957	1,074	783	−7.3	2,362	1,579	1.4	4.3	4.9
1958	1,066	819	5.3	2,661	1,491	−16.3	6.8	58.1
1959	1,194	813	−11.3	2,836	1,496	−5.7	5.5	−23.5
1960	1,175	833	4.1	2,752	1,404	−3.4	5.5	0.0
1961	1,125	741	−7.0	3,037	1,586	2.4	6.7	21.8
1962	1,128	804	8.2	3,159	1,776	7.7	5.5	−17.9
1963	1,345	936	−2.3	3,582	2,153	6.9	5.7	9.1
1964	1,345	973	3.9	4,328	2,696	3.7	5.2	−8.8
1965	1,420	1,079	5.1	4,725	3,029	2.9	4.5	−13.5
1966	1,497	1,046	−8.0	3,824	2,253	−8.1	3.8	−15.6
1967	1,283	877	−2.1	4,035	2,362	−0.7	3.8	0.0
1968	1,366	941	0.7	4,038	2,271	−3.9	3.6	−5.6
1969	1,571	1,015	−6.2	4,619	2,340	−9.8	3.5	−2.8

TABLE 1—*Continued*

	Illinois			*California*				
Year	*Number of Candidates*	*Number of Failed Candidates*	*Percentage Change in Failure Rates*	*Number of Candidates*	*Number of Failed Candidates*	*Percentage Change in Failure Rate*	*NUR*	*Percentage Change in NUR*
1970	1,940	1,227	−2.1	5,804	2,976	1.2	4.9	40.0
1971	2,437	1,567	1.7	6,299	3,360	3.9	5.9	20.4
1972	2,820	1,844	1.7	6,641	2,811	−20.6	5.6	−5.1
1973	3,241	2,114	−0.3	7,095	3,809	27.0	4.9	−12.5
1974	3,884	2,595	2.5	8,012	4,275	−0.6	5.6	14.3
1975	4,252	2,818	−0.7	8,637	4,838	−12.7	8.5	51.8
1976	4,951	3,455	5.3	9,210	5,367	7.1	7.7	−9.4
1977	5,292	3,774	2.1	9,607	5,588	−1.6	7.1	−7.8

Sources: Committee on Accountancy (Illinois) and California State Board of Accountancy.
NA = not available

largely an empirical question. Accordingly, this study proposes two hypotheses:

H$_1$: When the CPA exam was graded by a state, exam failure rates were associated with changing economic conditions.

H$_2$: CPA exam failure rates were not associated with changing economic conditions after a state permanently adopted the AGS.

Confirmation of the first hypothesis would support the economic theory of regulation as an explanation of the evolution and practice of accounting licensure. However, confirmation of the second hypothesis would suggest that centralized grading has removed any association between grading standards and economic conditions. Although the existence of a centralized grading system (with uniform grading standards) may appear to contradict the economic theory, Peltzman's [1976] extension of the theory allows for the possibility of a "backlash effect" if consumers perceive a regulary scheme to be overly abusive.

Data and Tests

This study hypothesizes that until states adopted the AGS, failure rates on the CPA exam were associated with changes in economic conditions. Table 1 provides CPA examination data from the accountancy board archives of two states—California (from 1921 to 1977) and Illinois (from 1919 to 1977)—to test this hypothesis.[8] As in Rayack's [1976] study, national unemployment rates (NUR), collected from U.S. Department of Commerce publications, serve as the explanatory variable.[9] CPA exam failure

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[8] The author was unable to obtain similar data from other states. Of the 30 state boards contacted, only one refused to provide the requested data. The others were willing, but unable, to provide data since failure rates in the pre-AGS-adoption period were unavailable.

[9] Because state unemployment figures for either state are unavailable for the entire observation period, state unemployment rates are not used as a proxy for general economic conditions. However, the author did obtain California unemployment rates for the period 1940 to 1977; Illinois data were unavailable.

The high correlation between California and national unemployment rates over that 38-year period—0.827—indicates that the results of this study were not likely to have been much different had California data been used instead of national data. Nevertheless, the post-adoption rates (FR) serve as the dependent variable.

The California failure rates were calculated somewhat differently than those for Illinois, due to the different data formats available to the author. The California state board provided four sets of data for each examination date: the total number of candidates, the number of successful candidates (i.e., those certified from that exam), the number conditioned, and the number failed. Dividing the total number of candidates into the number of failed candidates yielded FR.

The Illinois state board provided two sets of data: the total number of candidates and the number of successful candidates (defined as those who either passed the entire exam at the given date or who had conditioned previously and passed the remaining parts). Candidates who conditioned on the given exam date, but failed one or more parts of the exam, were counted as failures. FR was calculated as follows: 1−(number of successful candidates/number of total candidates).[10]

Unlike Rayack, this study uses differences instead of levels to avoid the serial correlation found when levels were used. The value for both the independent and dependent variables in a given year reflects the percentage change in the variable from the previous year. (Thus, the data begin in 1922 for California and 1920 for Illinois.)

The expectation is that the alteration hypothesis is valid only until each state permanently adopted the AGS. California did so in 1946; Illinois in 1957, although both states had used it previously [Bruschi and Ashworth, 1967].[11] Time series regressions on the California data were estimated for the period 1922 to 1945 and on Illinois for the period 1920 to 1956. The starting dates mark the earliest year that data were available; the final date of each time series is the year prior to permanent adoption of the AGS.

Regressions for each state were also estimated for the post-adoption period: for California, 1947 to 1977; for Illinois, 1957 to 1977.[12] If the AGS's control procedures have been effective at preventing state-level alteration of grading standards and if alteration has not been occurring on a national scale, a significant relation between changes in FR and changes in NUR should *not* be found.

Results

Table 2, panel A, shows the results of the California regressions and panel B shows regressions for Illinois.

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regression was run with changes in California unemployment as the explanatory variable in place of changes in NUR. The t-statistic for the California unemployment variable is −0.62; the R^2 is 0.01.

[10] The examination statistics for the two states could be made consistent in either of two ways: by using success, instead of failure, rates (i.e., the number of candidates allowed entry on a particular exam), or by adding conditioned candidates in California with failed candidates. The latter approach was tested and, although the results were generally consistent with those reported later in this paper, they were weaker ($t=1.41$, $R^2=.08$).

[11] That is, California first used the AGS before 1946 and Illinois before 1957, but both states later dropped the service.

[12] The post-adoption period for California begins in 1947 instead of 1946 because of a highly unusual change in failure rates from 1945 to 1946. The failure rate was 71.0 percent in 1945 and only 32.2 percent in 1946, a 54.6 percent decline.

Because this large reduction in FR coincides with a large increase in NUR, inclusion of this one observation results not only in a contrary sign for NUR, but a t-statistic (−1.64) that indicates significance at nearly the .10 level, and an increase in the coefficient of determination from 0.01 to 0.08.

This outlier may have resulted from post-war changes in the administration of licensing laws; for example, California adopted a restrictive licensing law—one that restricted auditing practice to licensees—in 1945, the final year of the pre-AGS period. This observation does not seem representative of either period and was, therefore, excluded.

TABLE 2

RELATION BETWEEN CHANGES IN FAILURE RATES AND NATIONAL UNEMPLOYMENT RATES

Period	Number of Years	Durbin-Watson	t-statistic	R^2
A. California				
1922–1945	24	1.94	2.76*	.26
1947–1977	31	1.97	0.37	.01
B. Illinois				
1920–1956	37	2.38	2.46*	.15
1957–1977	21	2.80	0.27	.00

* Significant at the .01 level

The results indicate that the null hypothesis—no significant (or negative) relation between changes in failure rates and national unemployment rates prior to adoption of the AGS—can be rejected at the .01 level for both California and Illinois. Changes in general economic conditions as reflected by national unemployment rates accounted for 26 percent of the variance in changes in failure rates for California and 15 percent for Illinois in the pre-adoption period. Also, for each regression, the Durbin-Watson statistic indicates the absence of significant autocorrelation.

The null hypothesis cannot be rejected in the post-AGS-adoption period for either state. This suggests that any alteration of grading standards that may have occurred in the pre-adoption period in response to economic conditions ended with adoption of the AGS.

To control for the possibility of a "Depression Era" or "World War II" effect, the pre-adoption-period regression for Illinois was rerun with the years 1930–1945 deleted. The NUR coefficient is still positive and significant; the t-statistic of 1.93 indicates significance at the .10 level. The explanatory power of the regression is relatively unchanged ($R^2=0.16$). This procedure was not applied to California because deletion of all Depression- and WWII-era data would have left only eight observations for the pre-AGS period. Instead, the California data was tested by adding an indicator variable that was assigned a value of 1 for the depression or war years and a value of 0 for all others. The coefficient for the indicator variable is negative. Moreover, the t-statistic for the NUR coefficient and the explanatory power of the regression were practically unchanged. This procedure was also applied to the Illinois data. Again, the indicator variable is insignificant. The NUR coefficient remains significant ($t=2.31$); R^2 is 0.18.

Discussion

This study has found a significant relation between changes in general economic conditions and CPA exam grading standards over the pre-AGS-adoption period in two states. Several limitations should be noted.

First, a third factor may have simultaneously influenced both FR and NUR, yielding results. For example, economic downturns may induce many persons in other, less remunerative occupations to sit for the CPA examination. Such a migration would have raised the total number of candidates (some of whom were less qualified) and could have resulted in a higher failure rate. This explanation can probably be rejected, however. Correlation coefficients were calculated for the number of candidates in each state and national unemployment rates in the pre-adoption period. For California, this coefficient was .173; for Illinois, −.183. Simply put, the number of candidates sitting for the exam does not appear to have affected failure rates.

Second, despite the apparent uniformity of grading standards in the post-adoption period, states can impose many other barriers to entry. To illustrate, each licensing jurisdiction still sets its own education and experience requirements. After Illinois adopted the AGS, for example, the state began the gradual phase-in of a four-year degree requirement; the requirement was fully implemented in 1967.[13] Similarly, California's education and experience requirements changed in the post-adoption period. Thus, examination grading policies provide only a partial explanation of a profession's licensing arrangements.

A third limitation of this study is that the validity of the results depends largely on the appropriateness of national unemployment rates as a proxy for general economic conditions. The high correlation between national and California unemployment rates indicates that the results probably are not sensitive to the choice of which unemployment rate to use. Although the use of other macroeconomic variables may have yielded somewhat different results, the use of such proxies is limited by data availability. This problem is especially acute for pre-World War II data.

Fourth, the study implicitly assumes a contemporaneous relation between changes in NUR and FR. However, any response of state boards to changes in economic conditions may have been lagged. For this reason, the relations between the two variables was examined with NUR lagged one year. For this test, levels were used, not differences, to determine whether or not failure rates in the current year were influenced by unemployment rates in the previous year. The pre-AGS (post-AGS) *t*-statistics were 2.49 (−.67) for California and 1.98 (.67) for Illinois. The pre-AGS *t*-statistics are significant at the .01 and .05 levels, respectively.

Finally, the study is limited by the unavailability of failure rate data from other states. However, California and Illinois are commercially important states and, therefore, not trivial cases. Second, Maurizi's [1974] research, which is based on *cross-sectional* data from *several* states, yielded results similar to this study.

In summary, the results indicate that when the Uniform CPA Examination was graded by the states, failure rates increased with downturns in economic activity. This evidence is consistent with the Stigler-Peltzman theory of regulation. In addition, the results show that changes implemented by the AICPA (and its predecessor, the AIA) seem to have ended the relation between failure rates and economic conditions.

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[13] Information on Illinois' education requirements was provided by the Secretary for the State's Committee on Accountancy.

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Expectation Formation and Financial Ratio Adjustment Processes

Cheng F. Lee and Chunchi Wu

ABSTRACT: This paper analyzes the adjustment processes of financial ratios in the presence of costly adjustment and information uncertainty. The paper proposes a generalized partial adjustment-adaptive expectations model to characterize dynamic financial ratio adjustment processes. The proposed model incorporates the persistence of changes in industry averages into the process of financial ratio adjustment. The Gauss-Newton nonlinear regression method is used to estimate the structural parameters of the generalized model. Results show that adjustment to target ratios is not instantaneous. Results also show that there are differences in the patterns of ratio adjustment for firms in different industries with different sizes.

IN traditional financial analysis, firms' financial ratios are often related to some predetermined targets which are usually based on industry norms. Empirical evidence [Lev, 1969; and Frecka and Lee, 1983] has generally indicated that firms adjust their financial ratios to industry norms. The causes of this dynamic adjustment have usually been attributed to either active attempts by management or passive industry-wide effects operating on the firm.

Although there is some evidence on the periodical adjustment of key financial ratios, there has been lack of a consensus on the pattern of the underlying adjustment process. Lev [1969] uses a partial adjustment model to characterize the dynamic financial ratio adjustment process while Frecka and Lee [1983] assume a generalized functional form that includes linear and log-linear adjustment processes as the special cases. In both studies, the desired "target" ratios are assumed to be the past or current industry averages.

Determination of the correct target ratios is important for the analysis of financial ratio adjustment. Waud [1966] and Doran and Griffith [1978] have shown that the way managers forecast desired targets can affect the pattern of ratio adjustment process. Recently, Moses [1987] also indicates that the relative magnitude of the expected and unexpected earnings components can affect the manager's choices of accounting procedures and ultimately affect the financial ratios and other accounting information reported. Lev [1969] recognized that potential problems may arise from using a past or current industry average as the firm's target ratio to examine the ratio adjustment process when the true target

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Cheng F. Lee, University of Illinois at Urbana-Champaign, and Chunchi Wu, Syracuse University.

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is not observed. However, no specific remedy was proposed for coping with these problems because of the difficulty of separating the transitory component from the permanent component of the changes in the industry averages.

The purpose of this paper is to extend Lev's partial adjustment model to consider explicitly the formation of desired targets. The paper suggests that the specific pattern of ratio adjustment depends upon the manager's assessment of the current industry conditions. Managers are assumed to follow an adaptive process to revise their target ratios by responding only to the assessed *permanent* changes in the industry averages.

A measure of the desired target ratio is developed in accordance with the theory of expectation formation. The ratio adjustment process is then reexamined based on the proposed framework.

The generalized ratio adjustment model proposed in this paper is capable of explaining a commonly observed practice of adjusting the firm's financial ratios to some targets. The empirical results indicate that the generalized ratio model explains the dynamic adjustment pattern of financial ratio better than does the simple partial adjustment model. Financial ratios have been used extensively for bankruptcy prediction [Altman, 1968], credit rating [Pinches and Mingo, 1973], security analysis [Reilly, 1986], and audit evaluation [Altman and McGough, 1974]. An important issue of using financial ratios for these purposes is how financial ratios change over time.

The remainder of this paper is divided into four sections. Section I discusses the importance of expectation formation in analyzing financial ratio adjustments and a cohesive model consistent with the partial adjustment and adaptive expectations processes is formulated. Section II describes the estimation method and the data used. Section III reports key empirical results and section IV concludes the paper.

I. A GENERALIZED FINANCIAL RATIO ADJUSTMENT MODEL

The partial adjustment model by Lev [1969] can be expressed as:

$$y_t - y_{t-1} = \lambda(y_t^* - y_{t-1}),\ 0 < \lambda \leq 1 \quad (1)$$

where

y_t = a firm's financial ratio in period t,
y_{t-1} = a firm's financial ratio in period $t-1$,
y_t^* = the target level of a particular ratio, and
λ = the speed of adjustment coefficient.

Equation (1) states that the current level of financial ratio, y_t, will move only partially from the previous position, y_{t-1}, to the target level, y_t^*. The amount of adjustment between time t and $t-1$ is equal to $\lambda(y_t^* - y_{t-1})$, where the fraction λ measures the speed of adjustment.[1] The size of λ reflects the limitations to adjustment caused by technological and institutional constraints.

Lev set:

$$y_t^* = x_k,\ k = t \text{ or } t-1 \quad (2)$$

where x_k is the industry average of a particular financial ratio at time t or $t-1$.[2] Lev found that the empirical results in terms of R^2 and the t-statistics for λ were better when x_t was used as the target level. Clearly, the magnitude of adjustment depends on both λ and y_t^*.

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[1] When λ is equal to one, adjustment to the target ratio is instantaneous. The smaller the value of λ, the greater the adjustment lag.

[2] Lev also noted that equation (2) can be made more general by setting $y_t^* = bx_{t-1}$. The coefficient $b \neq 1$ indicates that firms want to maintain a fixed deviation from the industry average.

As indicated by Lev, a major question facing the firm is the interpretation of any recent change in the industry mean. A change in industry mean can either be a permanent change or just a transitory fluctuation. The firm's financial ratio adjustment in approaching the industry mean would depend on the manager's assessment on the persistence of the current change in industry mean. If the change is largely transitory, then the adjustment is expected to be relatively small. Conversely, if the change in the industry mean is largely permanent, the adjustment would be relatively large.

One way to incorporate the expected persistence of the change in industry average into the ratio adjustment model is to specify the process for expectation formation. The specific process of expectation formation considered here is adaptive expectations. More specifically, let:

$$y_t^* - y_{t-1}^* = \delta(x_t - y_{t-1}^*) \tag{3}$$

or, equivalently,

$$y_t^* = \delta x_t + (1-\delta)y_{t-1}^* \tag{4}$$

where δ, the coefficient of expectations, is the proportion of the current change in industry average taken to be permanent rather than transitory (see Waud [1966]).[3] The target level is updated each period by a fraction of the discrepancy between the current level of industry average and the previous target level.

The adjustment process of the target ratio expectations specified in equation (4) implicitly assumes that corporate managers revise their expectations gradually. The magnitude of revision depends on the size of δ. The coefficient of expectations δ is the proportion of the industry change taken to be permanent rather than transitory. When $\delta = 1$, the expected target ratio is adjusted instantaneously to the current level of industry mean.

Recursively substituting the values of $y_{t-1}^*, y_{t-2}^*, \ldots,$ and y_{t-s}^* into the right-hand side of equation (4) gives:

$$\begin{aligned} y_t^* = {} & \delta[x_t + (1-\delta)x_{t-1} \\ & + (1-\delta)^2 x_{t-2} + \ldots \\ & + (1-\delta)^s x_{t-s}] \\ = {} & \delta x_t + (1-\delta)y_{t-1}^* \end{aligned} \tag{5}$$

Thus, the adaptive expectation model implies that the expected target ratio for any given year is an exponentially weighted moving average (EWMA) of past observed industry averages. According to the adaptive model, recent values of industrial averages are weighted more heavily in the moving average.

Equation (4) can be written as:

$$(1 - \phi L)y_t^* = \delta x_t \tag{4a}$$

where $\phi = 1 - \delta$ and L is the lag operator. The target ratio forecast follows an $AR(1)$ process if x_t is white noise. In general, the time series process of the target ratio forecast depends on the process generating the current industry average. For instance, if x_t follows a moving average process of order q, y_t^* will follow an $ARMA(1,q)$ process. Muth [1960] has shown that this forecast (for the unobserved target ratio) is the best linear forecast (in terms of the sum of squared error minimization) when x_t follows an $MA(\infty)$ process:

$$x_t = e_t + \theta \sum_{i=1}^{\infty} e_{t-1}, \tag{4b}$$

where e_t are random shocks independently distributed with mean zero and variance σ^2. Equation (4) permits estimation of δ from actual time series data. The estimated δ value will reflect management's assessment of the persistency of current industrial ratio changes. Substituting (5) into equation (1) yields:

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[3] Such an expectation formation process is based on the idea that current expectation is derived by modifying previous expectation with currently available information. The extent of expectation revision depends on the persistence of current information.

$$\begin{aligned} y_t = \lambda\delta[x_t + (1-\delta)x_{t-1} \\ + (1-\delta)^2 x_{t-2} + \ldots \\ + (1-\delta)^s x_{t-s}] + (1-\lambda)y_{t-1} \end{aligned} \qquad (6)$$

Using the Koyck transformation, equation (6) can be simplified as:

$$\begin{aligned} y_t - y_{t-1} = \lambda\delta x_t + (1-\lambda-\delta)y_{t-1} \\ -(1-\delta)(1-\lambda)y_{t-2} \end{aligned} \qquad (7)$$

Equation (7) characterizes the adjustment process of financial ratios in terms of the partial adjustment due to technological and institutional constraints and the adaptive expectations due to uncertainty and discounting of current information. If $\delta = 1$, then equation (7) reduces to:

$$y_t - y_{t-1} = \lambda(x_t - y_{t-1})$$

which is a version of Lev's partial ratio adjustment model. Thus, when the change in the industry mean is considered as permanent, the firm's revision of financial ratios will follow a simple partial adjustment process.[4] Hence, equation (7) represents a generalized case of Lev's model.

An estimate model can then be formulated based on equation (7) as:

$$y_t = a_0 + a_1 x_1 - a_2 y_{t-1} + a_3 y_{t-2} + u_t \qquad (8)$$

where

$$\begin{aligned} a_1 &= \lambda\delta \\ a_2 &= 2 - \lambda - \delta \\ a_3 &= -(1-\lambda)(1-\delta) \end{aligned}$$

and a_0 is the intercept term; u_t is the disturbance term. The disturbance term u_t may be serially correlated. Moreover, the regression model is nonlinear in the parameters. To obtain consistent and efficient estimates of the structure parameters δ and λ, a nonlinear regression method will be used while taking into consideration the behavior of the disturbance term.

II. ESTIMATION PROCEDURE AND DATA

The Gauss-Newton nonlinear least squares regression method is used to estimate the structural parameters of equation (8). However, the Gauss-Newton procedure converges very slowly for some firms in the sample. In slow converging cases, the Marquardt procedure is often proven to be a useful alternative method for obtaining convergence. As indicated in Draper and Smith [1966, p. 272], Marquardt's method combines the basic features of both the steepest descent and Gauss-Newton methods.

As with any nonlinear regression method, the selection of appropriate initial parameter values is important. The initial estimates of the parameters were obtained from the maximum likelihood procedure proposed by Zellner and Geisel [1970]. The disturbance term u_t may be serially correlated, or uncorrelated. Both cases for u_t (with and without serial correlation) are considered in estimating the regression coefficients.

Data were obtained from Standard and Poor's COMPUSTAT file for the period 1965–1984. COMPUSTAT's four-digit industrial classification was used as the basis for classifying industry groups. The sample contains the data for the firms with no missing financial data for the entire 20 years. Also, a restriction is imposed that at least ten firms are contained in each industry. This results in 112 firms in eight four-digit industries.

Following Lev [1969], six ratios were chosen to represent the popular categories of ratios:

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[4] The reduced equation is based on the assumption that either the current industry mean is available or the firms can obtain an unbiased prediction of the current industry mean.

Category	*Ratio Chosen*
Short-term liquidity	1. Quick ratio 2. Current ratio
Long-term solvency	3. Equity to total debt ratio
Short-term capital turnover	4. Sales to inventory ratio
Long-term capital turnover	5. Sales to total assets ratio
Return on investment	6. Net operating income to total assets ratio

As a proxy for the target ratio, industry averages are computed using the arithmetic means of each industry group.

III. EMPIRICAL RESULTS

Estimating Regression Parameters

Equation (8) was first estimated by the ordinary least squares regression (OLS) before estimating the more complicated nonlinear regression. The purpose of this exercise is to detect whether there is an indication of expectation adjustment lag. If the coefficients of y_{t-2} are significant, it will imply that expectation is not adjusted instantaneously (δ is not equal to one) and equation (8) is an appropriate model for characterizing ratio adjustment. The estimation of the structural parameters λ and δ by the nonlinear regression is then warranted.

Table 1 summarizes the cross-sectional distribution of the OLS estimates. As shown, the industrial average x_t is the most important variable in explaining the adjustment of financial ratios. The estimated coefficients for the equity-debt and sales-asset ratios are significant at ten percent level for about 80 percent of the firms in the sample. The coefficients for the rest of financial ratios are significant for about 50 percent to 60 percent of the firms in the sample. The next most important variable is the financial ratio lagged for one period, y_{t-1}. The coefficients of this variable for various financial ratios are significant for about 40 percent to 60 percent of the firms in the sample. The variable of the financial ratio lagged for two periods, y_{t-2}, also plays a role in the ratio adjustment process.

Table 2 summarizes the cross-sectional distribution of parameter estimates based on the nonlinear regression. The parameters were also estimated using the log values of financial ratios with results that are very similar to those in Table 2.

The overall results of nonlinear regressions show some evidence of both partial adjustment and adaptive expectations. The explanatory power of the model is relatively high, as indicated by the value of R^2. Most of the intercept estimates are very small and statistically insignificant. The estimated coefficients of partial adjustment (λ) and adaptive expectation (δ) mostly fall into the relevant range between zero and one with very few exceptions.

The size of λ measures the speed of adjustment to the target ratio. The closer λ is to one, the faster the adjustment. When λ is less than one, the level of financial ratios will move only partially from the prior position to the desired (target) position. As indicated in Lev [1969], two major types of costs affect the degree of partial adjustment: the cost of adjustment and the cost of being out of equilibrium. The former often results from the technological, institutional, and psychological inertia, and the increasing cost of rapid change. The latter often reflects the higher borrowing cost as a result of not conforming to the target.

The partial adjustment coefficients are higher for the current ratio, quick ratio, and equity-debt ratio. The current and quick ratios involve current items which are expected to have smaller cost of adjustment. The result for the equity-debt ratio is slightly different from Lev's. This difference may be explained by the recent trend of substituting short

TABLE 1
ORDINARY LEAST SQUARES ESTIMATES OF THE GENERALIZED RATIO ADJUSTMENT MODEL:
$y_t = a_0 + a_1 x_t + a_2 y_{t-1} + a_3 y_{t-2} + u_t$
(SAMPLE PERIOD: 1965–1984, $n = 112$)

	a_0		a_1		a_2		a_3		
	Estimate	*t-statistic*	*Estimate*	*t-statistic*	*Estimate*	*t-statistic*	*Estimate*	*t-statistic*	R^2
Quick Ratio									
Mean	−0.2028	−0.0865	0.8001	1.6089	0.3861	1.5846	−0.0451	−0.3114	0.4856
Std. deviation	1.2566	1.5986	1.1125	1.5976	0.2667	1.0710	0.2451	1.1269	0.2386
Fractiles									
.1	−1.2163	−1.8543	−0.0976	−0.1530	0.0594	0.2639	−0.3507	−1.9771	0.1539
.2	−0.5639	−1.2962	0.0693	0.1939	0.1877	0.6771	−0.2609	−1.3090	0.2407
.3	−0.3258	−0.8769	0.2765	0.8074	0.2189	0.9385	−0.1934	−0.8961	0.3346
.4	−0.1944	−0.3943	0.4329	1.3130	0.2599	1.2146	−0.1291	−0.5368	0.4047
.5	−0.0516	−0.1666	0.6093	1.5235	0.3437	1.4485	−0.0401	−0.1385	0.4916
.6	0.1216	0.4199	0.7225	1.8854	0.4585	1.8189	0.0430	0.1660	0.5836
.7	0.2641	0.7021	0.9506	2.2852	0.5064	2.0047	0.0974	0.4040	0.6181
.8	0.5289	1.0522	1.1804	2.8233	0.6003	2.4562	0.1494	0.6909	0.6945
.9	0.7817	1.6752	1.5724	3.3659	0.7185	2.7939	0.2601	1.0749	0.7991
Current Ratio									
Mean	−0.2703	−0.1783	0.7576	1.9145	0.3597	1.5012	−0.0234	−0.2831	0.5284
Std. deviation	1.4884	1.6954	0.6952	1.5926	0.2551	1.0712	0.2278	1.1055	0.2519
Fractiles									
.1	−2.1428	−2.1037	0.0127	0.0393	0.0624	0.2886	−0.3584	−1.8354	0.1607
.2	−1.0436	−1.4278	0.2453	0.8027	0.1364	0.7370	−0.1879	−1.3843	0.2441
.3	−0.6786	−1.0443	0.3602	1.2654	0.2205	0.9439	−0.1366	−0.9380	0.3795
.4	−0.3134	−0.6886	0.4657	1.4451	0.2744	1.1697	−0.0965	−0.4192	0.4675
.5	−0.0518	−0.1315	0.6167	1.6959	0.3267	1.4026	−0.0099	−0.0435	0.5462
.6	0.1413	0.1786	0.7520	2.0603	0.4014	1.6097	0.0446	0.1765	0.6212
.7	0.4561	0.7036	0.9500	2.4422	0.4750	1.9627	0.0986	0.4165	0.6825
.8	0.6316	1.1905	1.2983	3.1634	0.5487	2.2100	0.1424	0.6234	0.7994
.9	1.4433	1.8805	1.6206	3.6385	0.6978	2.8319	0.2401	1.2043	0.8643
Equity/Total Debts									
Mean	−0.1427	−0.4265	0.7936	3.2240	0.3734	1.7504	−0.0811	−0.7089	0.6947
Std. deviation	0.7559	1.6094	0.7241	2.0405	0.2956	1.3216	0.2156	1.2939	0.1872
Fractiles									
.1	−0.8459	−2.7300	0.1103	0.6531	0.0002	0.0016	−0.3560	−2.2670	0.4134
.2	−0.4976	−1.8132	0.3007	1.5144	0.1513	0.7716	−0.2392	−1.8591	0.5333
.3	−0.3582	−1.3724	0.4068	2.1637	0.2308	1.0842	−0.1925	−1.3484	0.6031
.4	−0.1776	−0.8649	0.5196	2.7773	0.2576	1.3829	−0.1381	−0.6895	0.6518
.5	−0.0393	−0.3086	0.6307	3.1320	0.3536	1.6356	−0.0882	−0.5128	0.7402
.6	0.0319	0.1871	0.7538	3.4956	0.3904	1.9080	−0.0221	−0.1485	0.8012
.7	0.0937	0.4795	0.8568	4.0366	0.4885	2.2134	0.0449	0.1756	0.8268
.8	0.2918	0.9717	1.1269	4.6836	0.5247	2.5213	0.0891	0.5278	0.8532
.9	0.6531	1.7097	1.4873	5.4866	0.7274	3.3838	0.1643	1.2135	0.9010
Sales/Inventory									
Mean	−1.5753	−0.3386	0.7486	1.9218	0.4335	1.7252	−0.0395	−0.3500	0.6047
Std. deviation	11.4524	1.6962	0.7913	1.6210	0.3385	1.4100	0.2627	1.0787	0.2669
Fractiles									
.1	−10.1616	−2.6753	0.0116	0.0844	−0.0441	−0.1464	−0.3803	−1.7401	0.1836
.2	−6.8159	−1.9328	0.1953	0.5521	0.1485	0.4892	−0.2440	−1.2564	0.3439
.3	−3.7829	−1.1881	0.3051	1.0558	0.2370	0.9252	−0.1977	−0.9113	0.4542

TABLE 1—*Continued*

	a_0		a_1		a_2		a_3		
	Estimate	*t-statistic*	*Estimate*	*t-statistic*	*Estimate*	*t-statistic*	*Estimate*	*t-statistic*	R^2
.4	−1.8385	−0.8040	0.3958	1.3333	0.3308	1.1748	−0.1292	−0.5596	0.5670
.5	−0.5813	−0.2107	0.5448	1.7869	0.4205	1.6351	−0.0817	−0.3346	0.6285
.6	0.7318	0.3603	0.7368	2.1706	0.5232	2.0329	−0.0175	−0.0622	0.7384
.7	1.5484	0.7327	0.8751	2.6385	0.6416	2.3507	0.0884	0.3672	0.7938
.8	2.9566	1.1895	1.1253	3.1085	0.7177	2.9623	0.2017	0.7650	0.8699
.9	4.9422	1.4580	1.7933	4.0090	0.8313	3.5457	0.2673	1.0191	0.9124
Sales/Total Assets									
Mean	−0.2192	−0.3170	0.7471	2.7640	0.4911	2.0953	−0.8056	−0.5875	0.7327
Std. deviation	0.9654	1.8877	0.6660	2.1363	0.2971	1.2571	0.2739	1.3240	0.1750
Fractiles									
.1	−1.4589	−2.4581	−0.0808	−0.1277	0.0932	0.5099	−0.4211	−2.0313	0.4546
.2	−0.7973	−1.9018	0.3157	1.2985	0.2417	0.9263	−0.3085	−1.7292	0.6265
.3	−0.5210	−1.3609	0.4495	1.7836	0.3361	1.4559	−0.2375	−1.2050	0.6683
.4	−0.2805	−0.9687	0.5927	2.2570	0.4086	1.8590	−0.1593	−0.8483	0.7174
.5	−0.0905	−0.4520	0.6871	2.7309	0.4780	2.0404	−0.0922	−0.5024	0.7586
.6	0.0158	0.0548	0.7974	3.1307	0.5847	2.4726	−0.0355	−0.2337	0.7963
.7	0.1074	0.3581	0.9670	3.4147	0.6622	2.8147	0.0591	0.2266	0.8526
.8	0.3451	1.0898	1.1592	3.9584	0.7249	3.0598	0.1302	0.6414	0.8783
.9	0.5793	2.0234	1.5980	5.2979	0.8980	3.5367	0.2569	1.0917	0.9234
Net Operating Income/Total Assets									
Mean	−0.0114	−0.3211	0.8035	2.6721	0.4470	1.9968	−0.1427	−0.7043	0.6144
Std. deviation	0.0686	1.5883	0.6329	2.0179	0.2998	1.3951	0.2309	1.1591	0.1955
Fractiles									
.1	−0.0747	−2.0324	0.1275	0.4195	0.0536	0.2599	−0.4647	−2.4794	0.2826
.2	−0.0386	−1.5178	0.3466	1.0737	0.1634	0.6625	−0.3810	−1.6927	0.4371
.3	−0.0333	−1.2283	0.4980	1.4771	0.2884	1.2108	−0.2468	−1.4089	0.5048
.4	−0.0235	−0.8226	0.5893	1.8906	0.3797	1.7002	−0.1962	−0.8583	0.5812
.5	−0.0119	−0.4364	0.7041	2.3673	0.4370	1.9036	−0.1577	−0.6609	0.6349
.6	−0.0013	−0.0387	0.8946	2.9056	0.5067	2.2561	−0.0636	−0.3216	0.7042
.7	0.0153	0.4094	1.0114	3.9206	0.5721	2.6388	0.0099	0.0396	0.7601
.8	0.0315	0.7859	1.2605	4.6099	0.6695	3.1089	0.0834	0.3813	0.7979
.9	0.0606	1.5937	1.5410	5.5180	0.9056	3.6596	0.1496	0.5953	0.8356

Note: y_t = a firm's financial ratio in year t,
x_t = the industry average of a particular financial ratio in year t,
y_{t-1} = a firm's financial ratio lagged by one year $(t-1)$,
y_{t-2} = a firm's financial ratio lagged by two years $(t-2)$,
u_t = the disturbance term of the regression model, and
$a_i, i = 0, 1, 2,$ and 3 represent intercept and regression coefficients, respectively.

term debt for long-term debt in the inflationary period [Taggart, 1984 and Zwick, 1977].

The value of δ depends on the stability of target ratio or the persistency of changes in industry mean. In general, the lag of expectation adjustment is due to the uncertainty of current information. Therefore, the extent of expectation adjustment would seem to depend on the information structure of a particular financial ratio. The sales and profits are likely to be less stable because they are affected by the random factors of the economy and industrial segments. On the other hand, one would expect that

TABLE 2

NONLINEAR REGRESSION ESTIMATES OF THE GENERALIZED RATIO ADJUSTMENT MODEL:

$y_t = a_0 + \lambda\delta x_t + (2-\lambda-\delta)y_{t-1} - (1-\lambda)(1-\delta)y_{t-2} + u_t$

(SAMPLE PERIOD: 1965-1984, $n=112$)

	a_0		λ		δ		
	Estimate	*t-statistic*	*Estimate*	*t-statistic*	*Estimate*	*t-statistic*	R^2
Quick Ratio							
Mean	0.0058	−0.1770	0.8053	1.5639	0.8459	1.4502	0.9590
Std. deviation	0.2779	1.2727	0.3223	2.1856	0.3262	2.0296	0.0348
Fractiles							
.1	−0.2709	−1.6986	0.3813	0.0087	0.3235	0.0087	0.9181
.2	−0.2103	−1.2045	0.5456	0.0254	0.5040	0.0256	0.9383
.3	−0.0978	−0.0806	0.6428	0.0390	0.6952	0.0383	0.9536
.4	−0.0504	−0.0398	0.7428	0.0514	0.7479	0.0513	0.9622
.5	−0.0300	−0.0249	0.7825	0.0299	0.8479	0.0807	0.9609
.6	0.0132	0.0051	0.8730	1.1329	0.8827	1.0233	0.9734
.7	0.0620	0.0190	0.9248	1.6951	0.9642	1.9071	0.9778
.8	0.1430	0.0623	1.0211	2.9424	1.1028	2.8718	0.9840
.9	0.3199	1.0001	1.2740	5.3631	1.2524	4.4716	0.9889
Current Ratio							
Mean	0.0239	−0.1927	0.7846	1.6919	0.8523	1.8467	0.9746
Std. deviation	0.4206	1.2504	0.3600	2.2151	0.3320	2.1608	0.0234
Fractiles							
.1	−0.4318	−1.9070	0.2456	0.0116	0.3790	0.0155	0.9679
.2	−0.2641	−1.2556	0.4114	0.0234	0.6248	0.0232	0.9645
.3	−0.1656	−0.2270	0.6196	0.0408	0.6553	0.0401	0.9726
.4	−0.0983	−0.0400	0.2129	0.0819	0.7616	0.0736	0.9775
.5	−0.0247	−0.0076	0.7825	0.9730	0.8280	1.1061	0.9808
.6	0.0317	0.0167	0.8566	1.6340	0.9069	1.9421	0.9337
.7	0.0922	0.0363	0.9308	2.1104	1.0038	2.5104	0.9862
.8	0.2606	0.2529	1.0707	2.8017	1.1461	3.8666	0.9909
.9	0.4958	1.0132	1.3339	4.9404	1.3411	5.5671	0.9925
Equity/Total Debts							
Mean	0.0351	−0.5107	0.8105	1.5038	0.7803	1.2217	0.8821
Std. deviation	0.6719	1.2289	0.3074	2.0456	0.3028	1.6150	0.0974
Fractiles							
.1	−0.5700	−2.3905	0.3796	0.0137	0.3253	0.0130	0.7637
.2	−0.3975	−1.6662	0.5778	0.0297	0.5209	0.0254	0.8369
.3	−0.2998	−0.5907	0.6640	0.0445	0.6769	0.0437	0.8681
.4	−0.1900	−0.0752	0.7177	0.0620	0.7593	0.0593	0.8917
.5	−0.1163	−0.0448	0.8442	0.1264	0.8419	0.1164	0.9047
.6	−0.0338	−0.0144	0.8919	1.0380	0.9104	0.9535	0.9253
.7	0.0938	0.0137	0.9802	1.9152	0.9687	1.9742	0.9410
.8	0.4780	0.0422	1.0665	3.1736	1.0079	2.8755	0.9500
.9	0.9802	0.1662	1.2534	4.8235	1.0835	3.7239	0.9636
Sales/Inventory							
Mean	−1.0646	−0.4761	0.7356	1.5370	0.8153	1.7593	0.9677
Std. deviation	10.2483	1.7893	0.3616	2.2665	0.3020	2.2027	0.0381
Fractiles							
.1	−3.3984	−3.6945	0.2201	0.0069	0.4525	0.0090	0.9207
.2	−1.4194	−0.9398	0.4089	0.0175	0.5476	0.0211	0.9472
.3	−0.7975	−0.1197	0.5042	0.0391	0.6543	0.0401	0.9620

TABLE 2—*Continued*

	a_0		λ		δ		
	Estimate	*t-statistic*	*Estimate*	*t-statistic*	*Estimate*	*t-statistic*	R^2
.4	−0.4413	−0.0453	0.6096	0.0499	0.7623	0.0659	0.9729
.5	−0.1675	−0.0119	0.7767	0.1978	0.8386	0.4999	0.9803
.6	0.0322	0.0044	0.8421	1.0206	0.8918	1.6338	0.9866
.7	0.5318	0.0274	0.9198	1.6217	0.9555	2.4725	0.9911
.8	1.6235	0.1256	1.0067	3.0585	1.0142	3.6524	0.9930
.9	2.8147	0.9767	1.2594	4.6675	1.1517	5.2113	0.9946
Sales/Total Assets							
Mean	0.0151	−0.2902	0.6813	1.2461	0.7944	1.4561	0.9846
Std. deviation	0.3130	1.4832	0.3016	1.9536	0.2641	1.8516	0.0160
Fractiles							
.1	−0.3148	−2.2583	0.2757	0.0167	0.5215	0.0166	0.9642
.2	−0.2004	−0.9665	0.4716	0.0327	0.6025	0.0325	0.9750
.3	−0.1257	−0.0681	0.5599	0.0435	0.6537	0.0439	0.9818
.4	−0.0503	−0.0366	0.6228	0.0678	0.6958	0.0659	0.9859
.5	−0.0046	−0.0048	0.6864	0.1071	0.7450	0.1059	0.9898
.6	0.0334	0.0191	0.7381	0.7763	0.8079	1.1067	0.9927
.7	0.0886	0.0552	0.7923	1.3105	0.9024	2.1496	0.9940
.8	0.1530	0.1809	0.9115	2.1076	1.0485	3.1416	0.9965
.9	0.3790	0.9634	1.0438	3.9211	1.1701	4.2864	0.9976
Net Operating Income/Total Assets							
Mean	0.0000	−0.0439	0.7543	0.7743	0.8023	0.8990	0.9061
Std. deviation	0.0271	0.8811	0.2468	1.3018	0.2454	1.5072	0.1038
Fractiles							
.1	−0.0317	−1.1375	0.4011	0.0087	0.4874	0.0087	0.7875
.2	−0.0234	−0.0893	0.5432	0.0174	0.6180	0.0175	0.8420
.3	−0.0132	−0.0533	0.6603	0.0314	0.6894	0.0315	0.9005
.4	−0.0079	−0.0241	0.7314	0.0386	0.7518	0.0385	0.9281
.5	−0.0015	−0.0079	0.7720	0.0556	0.8036	0.0564	0.9515
.6	0.0023	0.0092	0.8262	0.0763	0.8541	0.0757	0.9584
.7	0.0098	0.0268	0.8863	0.4224	0.9362	0.7126	0.9636
.8	0.0178	0.0601	0.9675	1.6702	1.0098	1.8424	0.9745
.9	0.0303	0.4365	1.0256	2.9014	1.0786	3.5164	0.9831

Note: a_0=intercept,
λ=the speed of ratio adjustment coefficient,
δ=the speed of expectation adjustment coefficient,
$\hat{\lambda}$ and $\hat{\delta}$ are the regression estimates of λ and δ, and
y_t, x_t, y_{t-1}, y_{t-2}, and u_t are defined as in Table 1.

the quick and current ratios are more stable because they are less affected by the complicated economic and random industrial factors.

The results in Table 2 confirm the existence of expectation adjustment lag. The adaptive expectation coefficients are generally higher for quick and current ratios and lower for the sales-total assets, equity-total debt, and net operating income-total asset ratios. The adaptive expectation coefficients of current and sales-inventory ratios are significant (at ten percent level) for about 40 percent of the firms in the sample. For the remaining financial ratios, the adaptive expectation coefficients are significant for about 30 percent of the firms in the sample.

The error structure of the regression model was also examined. The first order autoregressive coefficients of the financial ratios are mostly small and insignificant. The nonlinear regression parameter estimates are in general not sensitive to the treatment of autocorrelation.[5] Since the cross-sectional distribution of parameter estimates is very similar to those reported in Table 2, the distribution of autoregressive parameter estimates is not reported here.

Explicit consideration of expectation lag has improved the explanatory power of the ratio adjustment model. The results in Table 2 suggest that the simple partial adjustment model is not appropriate when there exists random fluctuation in the industry means. Furthermore, the decomposition of total adjustment lag into two parts, with one caused by costs of adjustment and the other by information uncertainty, allows determination of which factor contributes more to the adjustment lag.

Furthermore, the traditional partial adjustment model may overestimate the effect of adjustment costs on the speed of financial ratio adjustment. The average values of partial adjustment coefficients estimated by Lev range from .30 to .51, indicating a greater extent of the adjustment lag attributed to the costs of adjustment.[6] In contrast, Table 2 shows that the partial adjustment coefficients are in the range of .68 to .81 after the expectation lag is explicitly considered. In the present model, the adjustment lag is attributed to the costs related to adjustment and being out of equilibrium, and random information; while in the simple partial adjustment model, the lag is attributed only to the costs of adjustment and of being out of equilibrium.

Predictions of Future Financial Ratios

To provide some evidence on the forecasting ability of the generalized ratio adjustment model, the average percentage prediction errors and mean square errors for the generalized model and Lev's model were calculated and compared. The value of future ratio was estimated based on the past ratios of a firm, the assumed adjustment process, and an expectation of the future industry target ratio. The expected future industry target ratio was assumed to be x_{t-1}. Using x_{t-1}, y_{t-1}, y_{t-2}, and the parameters estimated from the generalized partial adjustment-adaptive expectation model and Lev's partial adjustment model, the estimates of future ratio $\hat{y}_t$ were obtained from equations (1) and (8), respectively (note that x_{t-1} replaces x_t in equation (8) in calculating $\hat{y}_t$). The prediction error was calculated as the difference between the actual ratio value y_t and the predicted value $\hat{y}_t$.

Table 3 summarizes the mean and standard deviation of the percentage prediction errors (PPE) and mean square errors (MSE) for various financial ratios. As indicated, the generalized ratio adjustment model produces smaller percentage errors and mean square errors than Lev's model for all types of financial ratios except for the mean square error of sales-inventory ratio. In fact, the difference between the MSEs of the sales-inventory ratio for two alternative models is rather small (.6627 versus .6581). In general, the differences be-

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[5] The assumption on the normality of the stochastic disturbance term is less crucial for the nonlinear regressions. Malinvaud [1975] has shown that even without the assumption of normality on the disturbance term, the asymptotic distribution of the nonlinear regression estimates is normal and has the same mean and variance as the maximum likelihood estimates for the normal disturbance case.

[6] These figures are based on the results using x_{t-1} as the target level since Lev did not report the cross-sectional distribution of coefficient estimates obtained for x_t.

Table 3
Summary Prediction Errors for the Generalized Ratio Adjustment Model and Lev's Partial Adjustment Model[a]
(Sample Period: 1965–1984, $n=112$)

	Generalized Model		*Partial Adjustment Model*	
	Mean	*Std. Deviation*	*Mean*	*Std. Deviation*
Quick Ratio				
PPE[b]	.1632	.1145	.1712	.1199
MSE[c]	.0949	.2655	.0985	.2535
Current Ratio				
PPE	.1183	.0626	.1256	.0672
MSE	.1691	.3757	.1839	.3765
Equity/Total Debts				
PPE	.4509	.3804	.4694	.3737
MSE	.5864	1.6611	.6342	1.6659
Sales/Inventory				
PPE	.0847	.0391	.1289	.1135
MSE	.6627	.5222	.6581	.4993
Sales/Total Assets				
PPE	.0919	.0652	.0954	.0636
MSE	.0436	.0970	.0469	.1085
Net Operating Income/Total Assets				
PPE	.4277	.4202	.4607	.4464
MSE	.0014	.0021	.0015	.0019

[a] The prediction errors e_t are estimated as follows:

(i) For the generalized ratio adjustment model:

$$e_t = y_t - \hat{a}_0 - \hat{\lambda}\hat{\delta}x_{t-1} - (2-\hat{\lambda}-\hat{\delta})y_{t-1} + (1-\hat{\lambda})(1-\hat{\delta})y_{t-2}$$

(ii) for Lev's partial adjustment model:

$$e_t = y_t - \hat{\beta}_0 - \hat{\beta}_1 x_{t-1} - \hat{\beta}_2 y_{t-1}$$

where β_0 is the intercept, and $\hat{\beta}_1$ and $\hat{\beta}_2$ are the regression coefficients of Lev's partial adjustment model, and e_t is the residual error.

All remaining variables are defined as in Tables 1 and 2.

[b] PPE = percentage prediction errors.

[c] MSE = mean square errors.

tween the PPEs of two models are larger for the equity-total debts and net operating income-total assets ratios. The difference between the MSEs of two models is the largest for the equity-total debts ratio. The larger differences in prediction errors generally occur for the financial ratios with relatively low adaptive expectation coefficients (δ). In contrast, for those ratios with higher expectation coefficients, the differences between the generalized model and Lev's model are relatively small. The findings in Table 3 indicate that the generalized ratio model with explicit consideration of the expectation adjustment lag has greater predictive ability.

Table 3 also shows that the prediction error standard deviations are smaller for the generalized ratio adjustment model for four ratios. However, the standard deviations of the mean square errors are smaller for the generalized model for only three ratios. The overall results show that the generalized model provides slightly better prediction efficiency than the partial adjustment model.

Industry and Size Effects

Recent studies have found that the choices of accounting procedures may vary across industries and firms of different sizes (e.g., Watts and Zimmerman [1986]; Zimmerman [1983]; and Moses [1987]). Thus, the time series process of financial ratios may, therefore, vary with industry and firm size. To provide information on possible effects of industry and firm size, the sample data were grouped by industry and firm size, and the same analytical procedure was applied to each group.

Table 4 reports the mean and standard deviation of λ and δ estimates by industry groups. The definition of group is based on the four-digit SIC codes. The overall results in Table 4 do not clearly indicate industry effects in the adjustment pattern of all financial ratios. For instance, the airline industry has higher λ and lower δ for quick and current ratios but not for other ratios. Similarly, the textile industry has higher λ and lower δ for sales-inventory ratio but not for other ratios. However, results do indicate that for a particular financial ratio, there are some variations in the speed of adjustment across industries.

The total sample is also divided into two size groups based on the value of firm. The firm value is estimated as the sum of total market value of equity and book value of short and long term debts. Table 5 summarizes the mean and standard deviation of λ and δ estimates by firm size. The large firm group has higher λ coefficients for all financial ratios except sales-inventory ratio. This suggests that large firms generally adjust their financial ratios more quickly than small firms. For the adaptive expectation coefficients, large firms have higher δ coefficients for quick ratio, equity-debt ratio, and sales-asset ratio. Results indicate that large firms tend to adjust their expectations more quickly for only certain ratios.

IV. SUMMARY

This paper extends Lev's partial adjustment model for financial ratios to consider explicitly the changes in management's expectations when the industry mean is highly variable. It introduces adaptive expectations into the partial adjustment model to explain the dynamic adjustment of firm's financial ratio toward the industry norm. The proposed model provides a generalized framework for examining the nature of financial ratio adjustment when there exist both adjustment costs and information uncertainty.

The nonlinear regression method is used to estimate the structural parameters of the partial adjustment-adaptive expectations model. Results show that adjustments to the target ratio is not instantaneous when the industrial mean is subject to random changes. Rather, managers seem to gradually revise their desired target ratio by taking into account the fundamental change which is considered to be persistent. The size of the adaptive expectation coefficients varies across different financial ratios.

TABLE 4

NONLINEAR REGRESSION ESTIMATES OF PARTIAL ADJUSTMENT AND ADAPTIVE EXPECTATION COEFFICIENTS BY INDUSTRY GROUPS*
(SAMPLE PERIOD: 1965–1984, $n=112$)

Industry Group	*Quick Ratio*		*Current Ratio*		*Equity/ Total Debts*		*Sales/ Inventory*		*Sales/ Total Assets*		*Net Operating Income/ Total Assets*	
	$\hat{\lambda}$	$\hat{\delta}$	$\hat{\lambda}$	$\hat{\delta}$	$\hat{\lambda}$	$\hat{\delta}$	$\hat{\lambda}$	$\hat{\delta}$	$\hat{\lambda}$	$\hat{\delta}$	$\hat{\lambda}$	$\hat{\delta}$
Textile	.7305 (.3289)	.8848 (.3441)	.7575 (.3741)	.8725 (.3387)	.6985 (.3132)	.8106 (.2278)	.9292 (.2106)	.6732 (.2306)	.6076 (.3365)	.7475 (.3079)	.6941 (.1927)	.6348 (.2217)
Paper & Forest Product	.7451 (.2974)	.8536 (.2667)	.8124 (.3171)	.8068 (.2767)	.7460 (.2286)	.8341 (.3792)	.6540 (.3273)	.8546 (.2514)	.6108 (.3503)	.7678 (.3430)	.8369 (.1708)	.8448 (.2699)
Chemical	.7908 (.3452)	.8838 (.3386)	.7439 (.3925)	.9321 (.2971)	1.0584 (.1805)	.6872 (.3691)	.7492 (.3694)	.8543 (.3194)	.7462 (.1770)	.8609 (.2216)	.7234 (.2179)	.7648 (.2013)
Oil	.8069 (.2489)	.9156 (.3041)	.8075 (.3302)	.9251 (.2935)	.8015 (.2920)	.7779 (.2818)	.6737 (.4309)	.8517 (.3030)	.6946 (.3179)	.8241 (.2139)	.6851 (.2896)	.7941 (.2811)
Mineral & Mining	.7204 (.3381)	.8104 (.3549)	.7689 (.3339)	.7962 (.3797)	.7505 (.3899)	.7708 (.3528)	.7635 (.3354)	.7823 (.3245)	.7295 (.3829)	.8097 (.2863)	.9015 (.2001)	.9355 (.1651)
Electronics	.6635 (.3238)	.7709 (.3053)	.7360 (.3371)	.7676 (.4159)	.8002 (.4008)	.7904 (.2975)	.7059 (.4942)	.8547 (.3348)	.6772 (.3222)	.6979 (.3329)	.7488 (.1777)	.7680 (.1863)
Airline	1.1507 (.3422)	.4985 (.2465)	.9638 (.5057)	.7290 (.3530)	.8880 (.2121)	.7875 (.3075)	.7448 (.2043)	.8518 (.2213)	.6549 (.2164)	.7723 (.1787)	.8027 (.3162)	.8903 (.2439)
Grocery Chain	.8810 (.2837)	.7119 (.3501)	.6294 (.3465)	.8976 (.4045)	.8905 (.3642)	.7607 (.2118)	.7589 (.3882)	.7470 (.4558)	.7574 (.2285)	.8429 (.2418)	.6915 (.2959)	.7919 (.2347)

* Standard deviations are in parentheses. $\hat{\lambda}$ and $\hat{\delta}$ are estimated from the model in Table 2. λ is the speed ratio adjustment coefficient and δ is the speed of expectation adjustment coefficient.

TABLE 5

NONLINEAR REGRESSION ESTIMATES OF PARTIAL ADJUSTMENT (λ) AND ADAPTIVE EXPECTATION (δ) COEFFICIENTS BY FIRM SIZE†
(SAMPLE PERIOD 1965–1984, $n=112$)

		Small Firms ($n=56$)	*Large Firms* ($n=56$)	*Test-statistics*
Quick Ratio				
	$\hat{\lambda}$	.8045	.8059	$t=$ .0229
		(.3211)	(.3262)	$F=$ 1.0320
	$\hat{\delta}$	.8064	.8254	$t=$ .3074
		(.3428)	(.3113)	$F=$ 1.2125
Current Ratio				
	$\hat{\lambda}$	.7689	.8003	$t=$ .4601
		(.3686)	(.3537)	$F=$ 1.0855
	$\hat{\delta}$	.8720	.8324	$t=$ −.6305
		(.3351)	(.3306)	$F=$ 1.0274
Equity/Total Debts				
	$\hat{\lambda}$	.7521	.8868	$t=$ 2.3715**
		(.3117)	(.2903)	$F=$ 1.1532
	$\hat{\delta}$	.7653	.7953	$t=$ .5235
		(.2923)	(.3148)	$F=$ 1.1592
Sales/Inventory				
	$\hat{\lambda}$	.7714	.6997	$t=$ −1.0497
		(.3490)	(.3735)	$F=$ 1.1453
	$\hat{\delta}$	.8300	.8004	$t=$ −.5183
		(.3189)	(.2860)	$F=$ 1.2435
Sales/Total Assets				
	$\hat{\lambda}$	.6340	.7284	$t=$ 1.6738*
		(.2871)	(.3104)	$F=$ 1.1686
	$\hat{\delta}$	.7859	.8029	$t=$ .3400
		(.2512)	(.2782)	$F=$ 1.2250
Net Operating Income/Total Assets				
	$\hat{\lambda}$	.7420	.7666	$t=$ .5267
		(.2347)	(.2597)	$F=$ 1.2254
	$\hat{\delta}$	.8118	.7926	$t=$ −.4129
		(.2532)	(.2392)	$F=$ 1.1206

† Standard deviations are in parentheses. $\hat{\lambda}$ and $\hat{\delta}$ are estimated from the model in Table 2. The critical value of $F(55,55)$ is 1.53 at five percent level.
* Significance at ten percent level, $t(.05,110)=1.671$.
** Significance at five percent level, $t(.025,110)=2.000$.

We also find that firm size and industry factors may affect the speed of financial ratio adjustment. Results show that large firms tend to adjust ratios more quickly than small firms. In contrast, large firms do not always adjust their expectations more quickly. Results also show that there are some variations in the ratio adjustment speed for different industries. However, results do not show a unique industry effect on the adjustment pattern of all financial ratios.

Results have two implications for understanding accounting choices. First, there is variation across firms in the process of adjusting to the assumed target. Since the selection of accounting rules depends on the expected accounting numbers or ratios [Givoly, 1985; and Moses, 1987], it is anticipated that accounting actions will also vary across firms. Estimated adaptive expectations coefficients vary across firms of different sizes and industry categories. Further research is needed to examine whether important firm-specific factors such as taxes, political costs, contractual relations, and ownership control may directly contribute to the variations in adaptation. Second, the analysis of income smoothing involves the specification of a smoothing device and an expected earnings number. Previous studies (see Moses [1987]) on income smoothing have usually used a simple random walk model to estimate earnings expectations and to define the smoothing measure. The random walk model is a special case of the adaptive model when $\delta=1$. The findings here support Givoly [1985] in suggesting that the adaptive expectations model is more appropriate for estimating expected accounting numbers for analyzing smoothing behavior.

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Initial Attributions and Information-Seeking by Superiors and Subordinates in Production Variance Investigations

Paul D. Harrison, Stephen G. West, and J. Hal Reneau

ABSTRACT: Behavioral aspects of production variance investigations have been the focus of several recent articles. This research reports on a field experiment designed to obtain empirical evidence concerning the initial attributions made by a superior and a subordinate upon the occurrence of an unfavorable variance, as well as the processes they utilize when testing their initial attributional hypotheses. Evidence indicated that superiors made initial attributions that were internal relative to the subordinates, and also tended to seek additional information which was internal relative to the subordinates. This observed confirmatory hypothesis testing procedure is consistent with other research in non-accounting related settings. Implications for the design of accounting information systems are briefly discussed.

THE existence of control systems within organizations, and the resulting superior-subordinate relationships, frequently require some type of periodic review of subordinate performance. The reviewer may seek answers to questions such as: Was the desired outcome attained? and, if not, Why was the subordinate's performance below expectation? Answers to such questions are central to control systems since they may affect employee motivation by means of compensation and changes in future performance expectations.

In managerial accounting, variance investigation has been one mechanism used for answering these questions. Initially, research in this area focused on the somewhat mechanical aspects of the decision to investigate [Magee, 1976, 1977a,b; Kaplan, 1969; Jensen and McKeown, 1977; and Dittman and Prakash, 1978, 1979]. Subsequently, researchers have proposed models based on agency theory to determine when firms should conduct variance investigations [Demski and Feltham, 1978; Baiman and Demski, 1980; and Kanodia, 1980]. There have been behavioral studies of the investigation decision based on information processing issues and the effect of using alternative incentive rewards [Magee and

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Paul D. Harrison is Assistant Professor, Kansas State University, Stephen G. West is Professor, and J. Hal Reneau is Associate Professor, both at Arizona State University.

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Dickhaut, 1978; Brown, 1981]. However, what has been largely ignored are factors which might influence the search for and understanding of the causes of variances. Knowledge of these factors might be of use to control system designers for the purpose of enhancing the effectiveness of control systems.

Attribution theory, a cognitive theory of perceived causality, has particular relevance here since it focuses on factors which may influence inferences about the causes of variances. An exploratory study [Shields, Birnberg, and Frieze, 1981] suggested that subjects used attributions to explain performance in a manner consistent with attribution theory. This theory has also served as a conceptual framework in auditing research [Arrington, Bailey, and Hopwood, 1985].

Generally, attribution theory concerns the processes by which individuals interpret the causal bases of events. Since both the antecedents and consequences of attributions may be examined [Green and Mitchell, 1979; Kelley and Michela, 1980; and Shaver, 1975], it should be particularly relevant in a control context. As Shields, Birnberg, and Frieze [1981] observed:

> One can see that [the] nature of [the] information utilized by either the superior or the subordinate *could* affect their initial attributions. Differences in the initial attribution may affect the search process—variance investigation—and the conclusions reached. Thus, . . . the attribution process plays a central role in the control system. [p. 73]

With regard to antecedents, information about subordinates' behavior and the circumstances under which the behavior occurred could be used to make initial causal attributions. The consequences of these initial attributions are the effects they exert on the information-seeking behavior of subordinates and superiors following their initial attributions. Previous research has investigated the antecedents of attributions in accounting contexts [Arrington, Bailey, and Hopwood, 1985]; however, evidence on the consequences of attributions has been limited to non-accounting contexts such as disciplinary actions by nursing supervisors [Mitchell, Green, and Wood, 1981; and Mitchell and Wood, 1980], and referrals by counselors [Batson, 1975]. The purpose of this study was to extend the work of Shields, Birnberg, and Frieze [1981] by examining both the antecedents and the consequences of initial attributions in a variance investigation context.

ATTRIBUTION THEORY

Individuals typically combine information in a logical manner to form inferences (attributions) about their own behavior and the behavior of others [Kelley, 1967; Kelley and Michela, 1980]. However, two important biases have been identified in the formation of such initial attributions.

The actor-observer bias [Jones and Nisbett, 1972] is the tendency of the actor (the person who is actively engaged in behavior) and the observer (the person monitoring the behavior of the actor) to have sharply divergent perceptions of the causes of the actor's behavior. The actor tends to emphasize the role of environmental conditions (including other persons) on behavior. In contrast, the observer tends to emphasize the role of properties (e.g., attitudes, personality traits) of the actor. Much research in psychology provides empirical support for the existence of this bias in a variety of contexts (see Jones [1976] and Watson [1982] for reviews). Applied to variance investigations, one would expect any variance, whether favorable or unfavorable, to be attributed by the superior to factors internal to the subordinate (actor), whereas the subordinate would tend to attribute the variance to factors in the environment.

The self-serving bias is characterized by actors' taking credit for their own successes and denying responsibility for their failures. That is, actors attribute success to their own (positive) personal dispositions, but attribute failure to environmental factors, particularly for cases in which the behavior has implications for their feelings of worth as a person (see reviews by Bradley [1978]; Weary and Arkin [1981]; and Zuckerman [1979]). As such, the bias tends to work with the first with regard to unfavorable variances. In this case, then, this bias enhances further differences between the attributions of the superior and subordinate.[1]

Consequences of Attributions

The formation of an initial attribution provides the attributor with a tentative hypothesis of the causes of a specific behavior. In an extensive research program, Snyder and his associates (see Snyder [1981] for a review) have investigated the processes through which humans attempt to test their initial attributional hypotheses and has identified three potential strategies that people may use in testing their hypotheses in social interactions. First is a confirmatory hypothesis testing strategy in which the individual preferentially solicits behavioral evidence whose presence would tend to confirm the hypothesis under scrutiny. Second is a disconfirmatory hypothesis testing strategy in which the individual preferentially solicits behavioral evidence whose presence would tend to disconfirm the hypothesis. Finally, the person may follow an equal opportunity strategy in which confirming and disconfirming evidence is solicited with equal diligence [Snyder and Campbell, 1980].

In an initial investigation, Snyder and Swann [1978a] provided participants with hypotheses about other individuals and found that subjects showed a strong preference for the confirmatory strategy. In their subsequent research, Snyder and Swann [1978b] carried out a series of experiments in an attempt to define the boundary conditions under which hypothesis testers will continue to use confirmatory strategies. They found that: (a) whether the information upon which the hypothesis was based was of high or low quality; (b) whether the *a priori* likelihood that their hypothesis would prove to be accurate was high or low; and (c) whether the incentive offered to the subjects for accurately testing their hypothesis was high or low made no difference. Subjects in all conditions in these experiments utilized a confirmatory hypothesis testing strategy. Snyder and Swann [1977] found that individuals who are not given a hypothesis to test follow an equal opportunity strategy. Finally, Snyder and White [1981] found that only when subjects are given specific instructions to falsify a hypothesis will they preferentially solicit hypothesis disconfirming questions. Thus, although individuals are capable of formulating equal opportunity and disconfirmatory hypothesis testing strategies, they typically tend to define the hypothesis testing task as one of preferentially building the case in support of their initial hypothesis by soliciting and accumulating hypothesis-confirming evidence [Snyder and White, 1981].

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[1] The effects of the actor-observer bias and the self-serving bias can only be differentiated in designs which include *both* positive and negative outcomes. In such cases, the actor-observer bias predicts that the actor will make external attributions relative to the observer regardless of the valence of the outcome, whereas the self-serving bias predicts that the actor will make internal attributions for success and external attributions for failure relative to the observer. In the present context, inclusion of *favorable* variance conditions would have seriously compromised the ecological validity of the study since variance investigations are rarely, if ever, conducted under these circumstances.

Applying the work on attributional biases and the work on hypothesis testing to the production variance investigation process, both the superior and the subordinate would be expected to make an initial attribution as to the cause of the unfavorable variance. The actor-observer bias predicts that the superior will make an internal attribution relative to the subordinate as to the cause of the unfavorable variance. The self-serving bias will accentuate this difference since the subordinate will make more of an external attribution in order to protect his or her self-esteem. In a variance investigation, each person would then be expected to proceed in a manner to confirm their initial attribution or hypothesis. The superior should solicit information supporting internal causes, and the subordinate should solicit information supporting external causes. Accordingly, the following substantive hypotheses are tested.

H_1: Upon occurrence of an unfavorable variance, attributions of superiors will be more internal than those of subordinates.

H_{2a}: Superiors will choose questions that tend to elicit more internal information than will subordinates.

H_{2b}: The internality of both the superiors and subordinates initial attribution will be significantly correlated with the internality of the subsequent questions chosen.

METHOD

Subject Sample

Members of the American Production and Inventory Control Society (APICS) were selected for study because they represent a diverse population of business persons in the Phoenix, Arizona metropolitan area and southeastern California who have had specific experience with production variances in their jobs. In addition, the superior-subordinate relation in the types of organizations for which the APICS' members work are typically well defined and most members have had experience in both superior and subordinate roles in their position. Materials were mailed to the full membership of the Phoenix chapter (367 persons), along with a cover letter from the president of the local chapter, stressing the importance of responding.

Manipulation of Independent Variables

The study had three independent variables: (a) information available to the participants (three levels); (b) role played by the participants (two levels); and (c) scenario (two levels).

Information. All subjects received a description of a failure to meet a production quota leading to a variance investigation. The information available to the participants was presented in the form of a brief work history of the subordinate being investigated. Following Kelley [1973], information suggesting an external attribution was manipulated by providing subjects with information that was high in distinctiveness, high in consistency, and high in consensus (see descriptions below).[2] Information implying an internal attribution was operationalized by providing information that was low in distinctiveness, high in consistency, and low in consensus. Finally, a no information control condition was included in which the subjects did not receive a prior work history.

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[2] Information is high in distinctiveness when there is low similarity between the actor's current performance and performance under dissimilar conditions. Information is high in consistency when the actor performed similarly on previous similar occasions. Information is high in consensus when other actors perform similarly to this actor.

More specifically, the descriptions for the superior condition were as follows:

> Hank Smith is one of your subordinates at a large manufacturing firm in charge of a production department. Your subordinate has failed to meet a shipment deadline on a rush order. Because of this error, the firm lost a contract that had a significant impact on sales.

This paragraph was the only information provided in the superior, no information control condition.

Subjects in the superior internal information condition received the following additional work history for the subordinate.

> Your subordinate has had previous failures on this specific type of rush order {high consistency}. He has frequently made errors on other rush orders {low distinctiveness}. In addition, your other subordinates who run production departments rarely miss shipment deadlines on this specific type of rush order {low consensus}.

Finally, subjects in the superior external information condition received the following additional work history for the subordinate.

> Your subordinate has had previous failures on this specific type of rush order {high consistency}. His performance on other types of rush orders has generally been error free {high distinctiveness}. In addition, your other subordinates who are in charge of production departments have frequently failed to meet shipment deadlines on this specific type of rush order {high consensus}.

Role. Subjects in the subordinate role were provided with work history information that was very similar to that described in the previous section. For example, the introductory paragraph in the subordinate role condition stated that:

> You are a subordinate at a large manufacturing firm in charge of a production department. You failed to meet a shipment deadline on a rush order. Because of this error, the firm lost a contract that had a significant impact on sales. This has been brought to the attention of both you and your immediate supervisor, the production manager.

The subordinate role information manipulations differed from those of the superior role by substituting phrases such as, "You have had previous failures . . ." for "Your subordinate has had previous failures . . .".

Based on research by Regan and Totten [1975], subjects were asked to imagine that the events described actually happened to one of their subordinates (superior role) or to them (subordinate role). Reminder statements were included periodically throughout the description and questions so that subjects would not forget whether they were playing the superior or subordinate role.

Scenario. The first scenario presented above dealt with a rush order. To increase generality, a second case dealing with a failure to meet a production quota on a new product line was also included.

Measurement of Dependent Variables

Two classes of dependent variables were utilized in this study, internality and information seeking.

Internality. To avoid nonthoughtful, casual responses [cf. Taylor and Fiske, 1978], the respondents first were asked to write down what they believed to be the one major cause of the unfavorable variance. Subjects then completed four scales used extensively in research on attributions for success and failure by Weiner and his associates (e.g., Weiner [1974]). Weiner postulated that four possible attributions can be made for success and failure: ability and effort are internal attributions, and task difficulty and luck are external attributions.[3] In the present study, subjects were asked to divide 100 points between these four causes. Following Weiner, the measurement of internality was computed as ability + effort − task difficulty − luck. Note that this measure of internality also serves as a manipulation check to see if the three information conditions were perceived properly by the participants.

Information Seeking. Two different measures of information seeking were developed following the general strategy utilized by Snyder and Swann [1978a] in another context. An extensive list of potential questions that could be asked in a variance investigation was first generated by consulting recent production management texts, production management faculty, and individuals currently employed in the production management area. After redundant questions had been eliminated, ten professors and advanced graduate students in management with extensive production backgrounds independently rated each of the questions on 11-point scales as to whether the question referred to something internal or external to the subordinate and his department.

Based on the ratings, the questions were divided into quartiles (very internal, somewhat internal, somewhat external, very external) and the five questions in each quartile which received the highest level of agreement in ratings among the judges were chosen for inclusion in the study.[4] For example, "Is the person in charge of this department an effective communicator?" was rated as a very internal question, whereas "Were there some engineering changes made that affected the production process in this department?" was rated as a very external question.

From the list of 20 questions that were provided, each subject was asked to select the ten questions that he or she would most want to have answered in the investigation of the present production variance case. The questions were presented in a randomized order and subjects were unaware of the judges' ratings.[5]

Two measures of information seeking behavior were developed. One used the average ratings of independent judges for each question to provide a scaled internality value; the mean internality value of the selected questions was computed for each respondent. The second measure was the proportion of questions selected by the respondent which were classified as internal versus external by the classifications of the independent judges. Questions with scale values below the median were classified as internal, whereas questions with scale values above the median were classified as external.

Procedure

Twelve different case forms of the questionnaire—3 information conditions × 2 roles conditions × 2 scenarios—were mailed out with each participant randomly assigned to one of the 12 cases.

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[3] Evidence that individuals use these categories in an accounting context is provided in Shields, Birnberg, and Frieze [1981].

[4] The intraclass correlation coefficient [Winer, 1971, p. 283] was computed to provide an overall estimate of the reliability of the judges' ratings for the 20 questions selected for use in the study. The resulting coefficient was .936, indicating that a set of questions with satisfactory reliability was selected.

[5] See the Appendix for a list of the questions used and judges' mean ratings.

Two days after the mailing, a postcard was sent to all subjects reminding them to complete the materials, and again stressing the importance of responding. Two weeks later an attempt was made to contact all nonrespondents in the Phoenix metropolitan area by telephone with a final request to respond.

Demographic variables were obtained on all subjects from APICS records. Available demographic information included: (1) company affiliation; (2) size of the company; and (3) public vs. private ownership of the company. This background information provided one means of comparing respondents and nonrespondents [cf. Cook and Campbell, 1979].

RESULTS

Response Rate Analysis

Responses were coded into four different categories: no response (54 percent); moved, not locatable (two percent); unusable response (four percent); and usable response (40 percent). Eliminating the individuals who never received the questionnaire, the overall response rate was 45 percent.

Chi-square analyses were performed to ascertain whether there were any systematic biases in the responses [cf. Cook and Campbell, 1979]. Analyses by the experimental variables indicated that respondents vs. nonrespondent status was not associated with information condition ($\chi^2(2)=2.207$, $p<.3$), with role ($\chi^2(1)=0.220$, $p<.6$), or scenario ($\chi^2(1)=0.146$, $p<.7$). Further analyses also indicated that respondents vs. nonrespondent status was not associated with prior company information ($\chi^2(1)=1.633$, $p<.2$), company size ($\chi^2(4)=3.105$, $p<.5$), or public vs. privately held company ($\chi^2(2)=2.259$, $p<.3$). Thus, there was no evidence of differential response rates by any of the experimental factors or the three characteristics available on all potential respondents from APICS records.

Attributions of Internality

The present measure of internal attributions was adapted from that used by Weiner [1974] and Arrington, Bailey, and Hopwood [1985]. A 3 × 2 analysis of variance (ANOVA) was conducted.[6] The net internal attribution score was used as the dependent variable. A positive score indicates the attribution was relatively more internal than external. Table 1 presents the ANOVA findings and the treatment means. The results directly support hypothesis one. Attributions made by the superior were significantly more internal than those made by the subordinate. The work history of the subordinate had a significant effect on the attributions made. Using the Scheffe method of multiple comparisons, follow-up tests indicated that the internal information condition differed from the external information condition, and from the no-information condition ($p<.01$). The no-information condition did not differ significantly from the external information condition. Examination of the separate Weiner categories indicated the role effect was significant on the ability, effort, and task difficulty measures (p's$<.001$), the role effect was not significant on the luck measure ($p<.15$). The information manipulation produced significant differences on the ability and task difficulty measures (p's$<.001$), but not on the effort and luck measures (p's$<.15$).

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[6] In this and the subsequent information seeking analysis, 3 × 2 × 2 (Information × Role × Scenario) ANOVAs were conducted. In all cases no significant main effects or interactions with scenario were detected. Thus, data from the two scenarios were combined.

TABLE 1
ANALYSIS OF VARIANCE AND TREATMENT MEANS FOR ATTRIBUTIONS OF INTERNALITY

A. Analysis of Variance

Source	*Sum of Squares*	*df*	*Mean Square*	F-*Statistic*	*Probability*
Role (R)	122,496.64	1	122,496.64	39.56	.0001
Information (I)	61,309.57	2	30,654.77	9.90	.0001
$R \times I$	4,365.46	2	2,182.73	.70	.4960
Error	418,065.49	135	3,096.78		

B. Treatment Means[1]

Treatment	*Mean*
Role:	
Superior	19.54
Subordinate	−39.41
Information:	
Internal	29.51 A
No Information	−20.00 B
External	−31.23 B

[1] The theoretical range of this measure is from +100, indicating extreme internality, to −100, indicating extreme externality. Treatment means for the information variable not sharing a common letter are significantly different using the Scheffé method of multiple comparisons ($p<.01$).

Information Seeking

The two measures of information seeking were analyzed in separate 3×2 analyses of variance. The first measure utilized the means for the ten questions circled by the respondents, where the value for each question was the mean of the independent judges' ratings of the internality of the information that would tend to be elicited by this question.[7] The lower the mean rating, the more internal the information-seeking behavior. Table 2 presents the ANOVA findings and the treatment means. The results support hypothesis 2*a*. The information-seeking behavior of the superior was more internal than that of the subordinate. The work history of the subordinate had a significant effect on the information-seeking behavior. Follow-up tests using Scheffé's method of multiple comparisons indicated that the internal information condition differed from the external information condition ($p<.01$), but did not differ significantly from the no information condition. The no information condition differed from the external information condition ($p<.01$).

Paralleling Snyder and Swann [1978a], the second measure of information seeking simply counts the number of questions circled by the respondents that are below (more internal than) the median of the means of the independent judges' ratings of the 20 questions. Table 3 presents the ANOVA findings and the treatment means. Once again, the information-seeking behavior of the superior

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[7] A selection of the ten most internal (external) questions would result in a mean internality score of 2.51 (6.12).

TABLE 2

ANALYSIS OF VARIANCE AND TREATMENT MEANS FOR MEAN RATING OF INFORMATION-SEEKING QUESTIONS

A. Analysis of Variance

Source	*Sum of Squares*	*df*	*Mean Square*	F-*Statistic*	*Probability*
Role (*R*)	1.27	1	1.27	4.36	.0387
Information (*I*)	4.66	2	2.33	7.98	.0005
$R \times I$	.40	2	.20	.69	.5026
Error	39.42	135	.29		

B. Treatment Means[1]

Treatment	*Mean*
Role:	
Superior	4.23
Subordinate	4.42
Information:	
Internal	4.09 A
No Information	4.25 A
External	4.55 B

[1] Low (high) mean ratings indicate internal (external) information-seeking questions. Treatment means for the information variable not sharing a common letter are significantly different using the Scheffé method of multiple comparisons ($p<.01$).

was more internal than that of the subordinate, providing additional support for hypothesis 2*a*. Although the pattern of means was in the predicted direction, the information effect failed to attain significance on this measure.[8]

Correlational Analyses

Role is not a perfect surrogate for attribution. Therefore, hypothesis 2*b* is a more direct test of whether superiors and subordinates engage in a confirmatory hypothesis-testing strategy. The correlation between the Weiner measure of internality and the mean rating of the information-seeking questions was $-.36$ ($p<.0001$), while the correlation between the internality score and the median rating of the information-seeking questions was $+.25$ ($p<.0031$).[9] These correlations indicate that superiors and subordinates did engage in a confirmatory hypothesis-testing strategy as predicted by hypothesis 2*b*.

DISCUSSION

In a typical management control process, feedback reports indicating significant departures from budget may trigger formal investigation processes by superiors and subordinates. These investigation processes are performed in order to gather information to explain the causes

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[8] As noted by one reviewer of this paper, forcing subjects to select ten out of 20 information items may have contributed to the small effect. If an individual had need for less than ten information items, the remaining items may have been of lesser concern and could dilute both information-seeking measures, thus biasing the results toward between group similarity.

[9] The two measures of information-seeking are scored in opposite directions accounting for the change in sign of the correlation coefficient.

TABLE 3
ANALYSIS OF VARIANCE AND TREATMENT MEANS FOR MEDIAN RANKING OF INFORMATION-SEEKING QUESTIONS

A. Analysis of Variance

Source	*Sum of Squares*	*df*	*Mean Square*	F-*Statistic*	*Probability*
Role (R)	12.96	1	12.96	8.69	.0038
Information (I)	6.82	2	3.41	2.28	.1058
$R \times I$	7.08	2	3.54	2.37	.0972
Error	201.56	135	1.49		

B. Treatment Means[1]

Treatment	*Mean*
Role:	
Superior	5.06
Subordinate	4.45
Information:	
Internal	5.15
No Information	4.72
External	4.49

[1] Higher mean values indicate more internal information-seeking questions.

of the observed performance, and can result in revised expectations for future performance and revised performance standards. This study reveals effects in both initial attributions and subsequent information search in a production variance investigation context.

With respect to initial attributions, two results emerged. First, consistent with research in non-accounting contexts, subjects given a work history in which the failure (production variance) was low in distinctiveness, low in consensus, and high in consistency made more internal attributions than subjects given a work history in which the failure was high in distinctiveness, high in consensus, and high in consistency. Second, subjects given the role of superior made more internal attributions for the unfavorable production variance than subjects given the role of subordinate. These results are consistent with other research on the actor-observer and the self-serving biases.

Both the work history and role manipulations led to subsequent effects on information seeking. Subjects who were given information that should lead to internal attributions sought to confirm their initial attributions by selecting questions that, if true, would provide more internal information, whereas subjects who were given information that should lead to external attributions sought to confirm their initial attributions by selecting questions that, if true, would provide more external information. Superiors also selected questions that would tend to elicit internal information relative to subordinates. Finally, significant mean within cell correlations were obtained between the internality of the subject's initial attribution and the internality of the questions he or she selected.

Applying these tentative findings to the design and use of management control systems, superiors and subordinates may reach divergent initial attributions concerning the cause of sub-standard performance, which may lead to friction in the control system. This friction may then be intensified when the superior and subordinate each search for information concerning the cause of failure, and each tends to confirm his or her initial attributional hypothesis as a result of their information search process. This could lead to disagreements between the superior and subordinate concerning appropriate remedial measures, revision of performance standards, or other corrective measures to be taken.

Some limitations of the present study should also be noted. First, non-respondent bias is a threat to validity. A number of techniques used by survey researchers were utilized in the present study to maximize the response rate. Further, attrition analysis following Cook and Campbell [1979], employing the three experimental variables and three background variables showed no evidence of non-respondent bias.

Second, the scenarios provided minimal information and were minimally involving. Further, each party had the same information available, whereas in an actual variance investigation, the subordinate will typically have access to more personal information. Extreme work histories were provided which eliminated the ambiguous situations that may often characterize real world settings, hence, likely attenuating the magnitude of the role effect. However, no interactions with role were obtained in the present study. The role effects were consistent across diverse work histories and scenarios. In the more ambiguous and uncertain actual situation with all of its multiple potential causes that could possibly explain an unfavorable production variance, it is possible that the role effects shown in the present study could be accentuated.

Third, the study measured only initial attributions and subsequent requests for information. Neither revised attributions nor subsequent actions that could be taken by the superior or subordinate were examined. Whether revised attributions and subsequent actions would reflect the observed role effect cannot be inferred from the present study.

Finally, results on the information-seeking measures were relatively small in terms of magnitude of effect and would have probably been stronger if we had not used a professional organization whose membership consists of individuals having diverse production backgrounds. Judd and Kenny [1981] point out that a diverse and heterogeneous sample will increase the probability of a type II error. While our results are statistically significant, even more pronounced results would be expected from a more homogeneous sample, for example, one drawn from a few relatively similar firms.

APPENDIX

LIST OF INFORMATION-SEEKING QUESTIONS

	Internality Mean Rating
Are the engineering studies used in establishing the standards fair and up to date?	6.5
Is the product design adequate for the needs of the department?	8.2
Were there some engineering changes made that affected the production process in this department?	7.9
Does the shop floor scheduling for this department do a good job?	4.8
Does this department follow the directives and policies issued from above?	2.3
Is there a good management-union climate at this firm?	6.5
Did this department file any requests for maintenance with the maintenance department?	1.9
Is the material requirements planning system operating in an efficient and effective manner?	6.4
Does this department have an adequate reward structure for its employees?	6.1
Could shift-to-shift communication in this department have an adverse effect on meeting production quotas?	1.9
Is the esprit de corps among the employees of this department good?	2.3
Is there a high turnover rate in this department?	3.3
Does this department have adequate supervision of its employees?	2.5
Are the laborers in this department concerned about being laid off in the near future?	6.9
Is the equipment maintenance carried out in this department adequate?	3.5
Is the training and development carried out within this department adequate?	3.9
Are there any major physical layout problems in this department?	4.0
Is there high absenteeism in this department?	2.5
Are the employees motivated in this department?	3.0
Is the person in charge of this department an effective communicator?	1.9

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Anomolies in Income Numbers: Evidence of Goal Oriented Behavior

Charles A. P. N. Carslaw

ABSTRACT: This Note reports that the frequency of occurrence of certain second digits (especially zero) contained in earnings numbers of New Zealand firms departs significantly from expectations. Specifically, there is a much higher than expected frequency of zeros and a less than expected frequency of nines as the second-from-the-left most digit in reported earnings. This abnormality may provide evidence of goal oriented or goal achieving behavior.

ACCOUNTING researchers have long been intrigued with the possibility that accounting techniques are being used to enhance reported income numbers. Most studies have assumed that it is management's objective to achieve a smoothed income trend. Rationales for this type of behavior have been produced by a number of authors [Cyert and March, 1963; Williamson, 1964; Monsen and Downs, 1965; and Amihud, Kamin, and Ronen, 1976].

This study examines evidence of an alternative type of income enhancement that firms may seek to achieve. This type of target is one based on the existence of key numbers or cognitive reference points. The achievement of these key numbers by companies may enhance the income number in the eyes of a reader of financial statements.

Numbers As Cognitive Reference Points

The existence of key numbers or cognitive reference points has been examined in psychological studies by Rosch [1975] and Gabor and Granger [1966]. They conclude that humans use numbers that are factors of ten as yardsticks in their perception and judgment of other numbers. This implies that when a person observes a number there is a tendency to round it up or down towards the nearest reference point in assessing its magnitude. For example, when one observes the number 5,984 or 6,020, there is a tendency to assess its magnitude as 6,000.

However, the existence of the "$1.99" pricing phenomenon in the marketing field has been well-known for many years. A price of $1.99 is perceived to be abnormally lower to a customer than one of $2.00. Brenner and Brenner [1982] suggest that this apparent perceptual discontinuity is caused by the biological constraint that human beings have only a limited amount of memory. That mem-

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Charles A. P. N. Carslaw is Senior Lecturer, University of Canterbury, New Zealand.

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ory will therefore be used to store the most relevant bits of information about a price. For example, in remembering a price of, say, \$398, a person will place the most emphasis on the first digit, less on the second, and so on progressively through the number. Thus, people appear to round down to \$390 or \$300 rather than up to the more rational reference point of \$400 because the process of rounding up is a more complex process than rounding down. Efforts to provide evidence on this by Georgoff [1972] and Lambert [1975] have been inconclusive.

From an accounting perspective key reference numbers or points will be used as yardsticks by interpreters of the financial statements and by budget setters within the organization. Where uncertainty exists about a final outcome, ex-ante estimates will be rounded to rough figures which will emphasize the left-most figures in the expected number. Since business tends to be performance and achievement oriented, there are abnormal rewards attached to achieving an expected goal rather than just falling short. There will be pressure on management to meet that expectation by ensuring that the first digit is at least as large as that of the users' expectation. Relatively less emphasis will be placed on meeting the first two digits and so on progressively through the number.

Because of this process, the income figure becomes enhanced to an abnormal degree in the mind of the preparer and the user of the information by merely ensuring that income numbers exceed key reference points by either real or artificial means rather than remain just below them and vice versa.

If this phenomenon exists, there will be an abnormal distribution of the second-from-the-left digits of income numbers by producing an abnormally low occurrence of high digits in the second place of numbers and a compensating abnormally high frequency of lower digits in order that the number just exceeds the major reference point.

Research Design

In order to determine whether this phenomenon exists, the frequency of occurrence of numbers appearing as the second digit in income numbers of New Zealand companies was examined. The following null hypothesis was therefore established:

> H_0: The occurrence of numbers appearing in the second place conforms to the expected random distribution.

The alternative hypothesis supporting the existence of key number targeting is that the occurrence of numbers in the second place of income numbers will not conform to the expected random distribution and that there will be an abnormally high frequency of the number zero and an abnormally low occurrence of the number nine.

Income figures appearing in the financial statements of 220 New Zealand listed companies for the period January 1, 1981 to December 31, 1985 were tabulated. This sample represents all of the major companies on the New Zealand Stock Exchange at December 31, 1985 which had at least one profit announcement to that date. Mining companies were excluded since income numbers are not, in general, relevant figures for such companies when they are still in the exploratory stage. Losses were also excluded since it is probable that any bias in the digits in negative income years will differ from those in positive income years. For any year in which extraordinary income turned an ordinary loss into a net income, and vice versa, the positive

TABLE 1
FREQUENCY OF FIRST DIGITS IN INCOME NUMBERS
($n=805$)

		Ordinary Income		Net Income	
Digit	*Expected Frequency*[a] *Percent*	*Observed Deviation Percent*	*Z-statistic*	*Observed Deviation Percent*	*Z-statistic*
0	—	—	—	—	—
1	30.1	+2.5	+1.54	−0.9	−0.56
2	17.6	−2.8	−2.09*	−2.3	−1.76
3	12.5	+1.1	+0.94	+2.3	+1.97*
4	9.7	+0.5	+0.48	+0.5	+0.48
5	7.9	−1.1	−1.16	−0.9	−0.95
6	6.7	−0.1	−0.11	+0.7	+0.91
7	5.8	−0.2	−0.24	−0.6	−0.73
8	5.1	+0.2	+0.26	+0.6	+0.77
9	4.6	−0.1	−0.14	+0.6	+0.81
	100.0	—		—	
χ^2		=7.64		9.33	

[a] Computed via Feller's formula.
* Significant at the .05 percent level.

ordinary income or net income was included in the selection.

Since companies in New Zealand round the numbers to the nearest thousand dollars, an income figure of less than $10,000 will not contain any second or third digit and one between $10,000 and $100,000 will not contain any third digit due to the rounding process. The sample, thus, becomes marginally smaller as later digits are examined.

Intuitively, the probability of any digit occurring in a particular location in a number would seem to be one ninth for the first digit and one tenth for later digits. However, this is not the case. Feller [1966] developed a proof that the empirical distribution of any integer N appearing as the first digit for numbers taken at random from a large body of physical or observational data is $log_{10}(N+1)-log_{10}N$. Feller's proof was applied and extended to determine the probability of each integer appearing as the second digit of any random number. These probabilities are shown in Tables 1 and 2.

Tests on Digits

In order to ensure that there was no overall bias in the size of the income numbers, Z-statistics were computed on the frequency of occurrence of each digit in the first (leftmost) digit and a χ^2 test was conducted over all nine digits. The results are shown in Table 1. The income announcements do not deviate widely from the expected distribution in overall terms. There is only one digit with a Z-score that was significant at the .05 level for ordinary income and one for net income. While this is more than would be expected by chance, overall, the distribution of digits conforms to expectations and the sample does not exhibit any macroscopic concentrations.

TABLE 2
FREQUENCY OF SECOND DIGITS IN INCOME NUMBERS
($n = 804$)

		Ordinary Income		*Net Income*	
Digit	*Expected Distribution Percent*	*Observed Deviation Percent*	*Z-statistic*	*Observed Deviation Percent*	*Z-statistic*
0	12.0	+4.5	+3.91**	+4.0	+3.48**
1	11.4	+0.4	+0.36	−0.4	−0.36
2	10.9	−1.2	−1.09	−0.1	−0.09
3	10.4	+0.3	+0.28	−0.2	−0.19
4	10.0	−1.0	−0.94	−1.6	−1.51
5	9.7	−1.0	−0.96	−0.5	−0.49
6	9.3	+0.1	+0.10	−0.5	−0.49
7	9.0	+0.4	+0.40	−0.0	−0.00
8	8.8	−0.4	−0.40	+0.8	+0.80
9	8.5	−2.1	−2.14*	−1.5	−1.53
	100.0	—		—	
χ^2		=20.85*		15.96	

* Significant at the .05 level.
** Significant at the .01 level.

The frequency of occurrence of second digits for ordinary income and net income is shown in Table 2.

Because income announcements and earnings ratios in New Zealand may be based on either ordinary or net income, in contrast to the North American practice of focussing on ordinary income, an examination was performed on that income number normally emphasized by a company in its annual report to shareholders. The basis of determining the emphasis was by an examination of the income figure quoted in the directors' report and used in earnings ratio computations in the trend statement of the company. These results are shown in Table 3.

In Tables 2 and 3 there is evidence of a strong bias toward numbers having zero as the second digit. In each of the four populations the deviations from the expected distribution are significant at least at the .05 level for both ordinary and net income. For ordinary income the bias is far stronger and, for companies that clearly emphasize ordinary income as their key indicator, more than one in every five income announcements contains the figure zero as its second digit.

Although not as strong as the emphasis on zero as the second digit, there is a consistent lack of nines as the second digit which is significant at the five percent level in three of the four cases. This lends strong support to rejection of the hypothesis that the distribution of second digits is random. The distribution as a whole deviates significantly from the expected distribution at the .025 level for all ordinary income announcements and at the .001 level when only those companies which emphasize the ordinary income figures in their financial statements are selected.

Of particular interest is the combination one followed by a zero. In each of the distributions this combination was

TABLE 3
FREQUENCY OF SECOND DIGITS FOR EMPHASIZED INCOME NUMBERS

		Ordinary Income (n=319)		Net Income (n=252)	
Digit	Expected Distribution Percent	Observed Deviation Percent	Z-statistic	Observed Deviation Percent	Z-statistic
0	12.0	+8.7	+4.78***	+5.1	+2.49***
1	11.4	−1.7	−0.95	+1.3	+0.65
2	10.9	−3.1	−1.78*	+2.2	+1.12
3	10.4	+0.3	+0.18	+1.9	+0.99
4	10.0	−1.5	−0.89	−1.3	−0.69
5	9.7	−1.9	−1.15	−3.0	−1.61
6	9.3	+0.1	+0.06	−0.2	−0.11
7	9.0	+1.7	+1.06	−2.6	−1.44
8	8.8	+0.6	+0.37	−0.5	−0.28
9	8.5	−3.2	−2.05**	−2.9	−1.65*
	100.0	—		—	
χ^2		=30.66***		15.02	

* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.

found to be by far the most common. It would appear that most key reference points are numbers which just exceed 10^k where k is a positive integer and do not favor numbers that fall just below those key reference points.

Tests on Corporate Ownership

Based on the evidence that companies may enhance their income numbers through the use of key number targeting, it is of interest to determine the nature of companies adopting this strategy. Two classes of companies that have been widely investigated for differential income manipulation characteristics are those controlled by owners in control to those that have no dominant owner and are deemed to be controlled by management. Rationale for income enhancing tactics and strategic behavior by manager controlled enterprises has been proposed by Williamson [1964], Monsen and Downs [1965], Amihud et al. [1976], and Lambert [1984]. They argue that management in corporations where no dominant owner exists will enhance their income streams in order to generate an acceptable amount of profit from year to year in order to avoid adverse feedback and to maintain confidence in their managerial ability. In contrast, in owner dominated companies such a practice is unproductive since the dominant shareholder is aware of the firm's position. White [1970], Dascher and Malcom [1970], and Kamin and Ronen [1978] provide evidence on the existence of greater smoothing in management controlled firms. However, Dhaliwal et al. [1982] suggest that income maximization may be the aim of accounting policy manipulations. Schroeder [1984] concluded that income maximizing accounting manipulation was more common in

TABLE 4

FREQUENCY OF SECOND DIGITS FOR INCOME NUMBERS FOR OWNER AND MANAGER CONTROLLED FIRMS

		Owner Controlled Firms					
		Domestic ($n=244$)		*Overseas* ($n=126$)		*Manager Controlled Firms* ($n=434$)	
Digit	*Expected Frequency Percent*	*Observed Deviation Percent*	*Z-statistic*	*Observed Deviation Percent*	*Z-statistic*	*Observed Deviation Percent*	*Z-statistic*
0	12.0	+9.3	+4.47***	−0.5	−0.18	+4.1	+2.63**
1	11.4	−1.1	−0.54	−0.6	−0.22	+0.6	+0.39
2	10.9	+0.6	+0.30	−4.7	−1.72*	−0.5	−0.33
3	10.4	−1.4	−0.71	+2.7	+1.01	+0.2	+0.14
4	10.0	−2.2	−1.15	−1.5	−0.57	−1.2	−0.83
5	9.7	−2.3	−1.22	+2.6	+1.00	−1.9	−1.34
6	9.3	+3.0	+1.61	−3.9	−1.53	+1.8	+1.30
7	9.0	+0.8	+0.44	+2.4	+0.96	−0.5	−0.37
8	8.8	−3.2	−1.93*	+1.2	+0.48	+0.6	+0.44
9	8.5	−3.5	−1.79*	+2.3	+0.94	−3.2	−2.39**
	100.0	—		—		—	
χ^2		=29.77**		8.80		15.45	

* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.

manager controlled firms than it was in owner controlled firms.

If manager controlled enterprises have greater incentive to enhance their income, it is expected that they may exhibit the targeting phenomenon more than owner controlled firms. The sample was therefore initially segregated into two groups; owner controlled and manager controlled firms. The basis for classification as an owner controlled group was the same as Kamin and Ronen [1978] where it was assumed that an owner controlled firm was one in which one shareholder owned more than 30 percent of the outstanding common stock of an entity.

Because many New Zealand listed companies are controlled by overseas entities, the owner controlled group was further subdivided into domesticly controlled and overseas controlled companies. The reason for this is that the key reference point of an overseas majority shareholder is likely to be in the currency of the foreign country. The cognitive key numbers may therefore not be the same as the domestic ones because of the currency translation. Therefore, for the foreign owner controlled group, it is expected that targeting will not be detecable.

The income number selected was again based on the emphasized income number in the annual report. If no emphasis was evident the ordinary income number was chosen. Results for these three groups are reported in Table 4.

As shown in Table 4, for overseas controlled companies, the distribution of second digits is close to the random distribution. On the other hand domestic owner controlled companies exhibit most strongly the abnormality and more than one in five of their income figures fall just in excess of key reference points. Finally, manager controlled firms also exhibit reference point behavior. The domestic owner control finding is contrary to expectations and to the results of previous studies in that there seems to be greater management of the earnings number by owner dominated enterprises than by their manager controlled counterparts to enhance their income through the meeting the key number target.

CONCLUSIONS

An abnormality in the distribution of income numbers appearing in financial statements of New Zealand firms has been demonstrated and the bias has been shown to be towards numbers in excess of key cognitive reference points of $N\times 10^k$. In particular numbers just in excess of factors of 10^k are especially common. Domestic owner controlled as well as management controlled companies exhibit the abnormality.

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SMALL SAMPLE STUDIES

M. Edgar Barrett, Editor

Equity Accounting for Reciprocal Stockholdings

Michael E. Bradbury and Shirley C. Calderwood

ABSTRACT: This paper discusses the problem of equity accounting for reciprocal stockholdings. Alternative accounting treatments are presented. Illustrations of some of these alternatives are discussed which are drawn from actual practice in New Zealand. The treatments are classified and evaluated according to two broad underlying theories of equity accounting.

EQUITY accounting is an internationally accepted method of accounting for investments in non-subsidiary associated companies.[1] In recent years there has been a marked increase in reciprocal stockholdings between two or more associated companies.[2] These bilateral stockholdings cause difficulties when calculating the amount of the investee's net income to be recognized by the investor using the equity method. In New Zealand various solutions have been proposed but no general consensus has been achieved.[3] We believe disagreements over the appropriate solution reflect a fundamental disagreement concerning the concept of the reporting entity; a disagreement which has its roots in general consolidation theory.

This issue is timely. In April 1986, the FASB expressed its desire to develop a concept of reporting entity and to apply that concept to specific accounting policy issues, including the equity method

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[1] Professional pronouncements on equity accounting in English-speaking countries are very similar (see Gniewosz [1979, p. 115]). These pronouncements typically permit equity accounting to be used when accounting for the income from an investment where the investing company is able to exercise significant influence over the investee company and holds between 20 and 50 percent of the shares of the investee company. The investee company in these circumstances is referred to as an "associated company" of the investor. Equity accounting is also acceptable, in some special cases, in accounting for investments in subsidiary companies.

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Michael E. Bradbury and Shirley C. Calderwood are Senior Lecturers at University of Auckland.

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of accounting for reporting an entity's investments in common stock [FASB, April 1986].

In this paper, we first outline alternative methods of equity accounting for reciprocal holdings. In the second section, we illustrate the accounting issue by outlining the accounting policies adopted by three leading New Zealand companies which became linked via reciprocal stockholdings. In the third section, we discuss the conceptual implications of these alternatives and our conclusions are given in section four.

THE ALTERNATIVES

Equity accounting is a method of accounting for the income from an investment whereby the investor company includes in its reported profits a proportion of the profits of the investee company. If a company owns 40 percent of another company, its total reported profits will comprise its own profits plus 40 percent of the other company's profits. The book value of the investment in the associated company is increased (decreased) in each financial year by the investor's share of the post-acquisition profits (losses) of the associate less dividends received from the associate.

A reciprocal holding situation arises when two companies own a significant, non-controlling interest in each other. If two companies own, say, 40 percent of each other, both companies are entitled to report, in addition to their own profits, 40 percent of the other company's profits. The problem is that the profits of each company now include a percentage of the other company's profits, and equity accounting may lead to a company reporting its own profits more than once—i.e., first as its own profits, and second, as part of the profits of the other company which have been accounted for on an equity basis.

In this section, we contrast the principal methods developed to deal with the problem of equity accounting for reciprocal stockholdings using the following common example. Company A acquires a 30 percent interest in Company B on January 1, 1985 (cost $120,000). Company B acquires a 20 percent interest in Company A on the same day (cost $100,000). Both companies have fiscal years ending on December 31. Table 1 shows the income statement and balance sheet for each company for the 1984 financial year immediately preceding the acquisitions. It is assumed that neither company issues additional shares or debt in order to fund the investment. This means that operating assets at January 1, 1985 revert to the same level as at January 1, 1984 (i.e., $1,000,000 for Company A). The balance sheet for Company A immediately following the acquisition is also shown in Table 1. Assuming both companies achieve the same return on opening operating assets in 1985 as they did in 1984, both companies will generate the same operating profit in 1985 as was achieved in 1984. Thus, any change in the net income of Companies A or B in 1985 is due solely to reported investment income. The amount of the reported investment income, however, depends on the method of accounting for the reciprocal holding. Table 2 shows the results that would be reported for Company A in the 1985 financial year under each of the methods that may be used to account for the investment in B.[4] It is

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[2] Trow [1985, p. 49] reports 16 listed companies with substantial reciprocal stockholdings in New Zealand.

[3] Although this paper uses a New Zealand example to illustrate the problem of non-subsidiary reciprocal stockholdings, their existence is not restricted to that country. Refer to Choi and Mueller [1984, p. 213].

[4] A market value method was not included because the objective of equity accounting would not appear to be that of reporting the economic consequences of holding the investment. See APB [1971, par. 9].

TABLE 1

ILLUSTRATIVE EXAMPLE OF EQUITY ACCOUNTING FOR RECIPROCAL HOLDINGS

I. PRE-ACQUISITION

	December 31, 1984 ($000's)	
	Company A	*Company B*
INCOME STATEMENT		
Operating Income	150	140
STATEMENT OF RETAINED EARNINGS		
Balance, Jan. 1	310	250
Net Income	150	140
	460	390
Dividends Paid	30	40
Balance, Dec. 31	430	350
BALANCE SHEET		
Operating Assets	1,120	700
Total Assets	1,120	700
Common Stock (Par $1)	50	40
Retained Earnings	430	350
Stockholders Equity	480	390
Liabilities	640	310
Total Equities	1,120	700
RATIOS		
Earnings per share	$3.00	$3.50
Operating income/opening operating assets	15%	23%
Net income/opening stockholders' equity	42%	48%

II. POST-ACQUISITION

	January 1, 1985 (000's)
	Company A
BALANCE SHEET	
Operating Assets	1,000
Investment in Company B	120
Total Assets	1,120
Common Stock (Par $1)	50
Retained Earnings	430
Stockholders Equity	480
Liabilities	640
Total Equities	1,120

Note: The operating assets at January 1, 1984 were $1,000,000 for Company A and $600,000 for Company B.

TABLE 2
COMPARISON OF ALTERNATIVE METHODS OF EQUITY ACCOUNTING FOR RECIPROCAL HOLDINGS

Company A	*Cost* *Dec. 31, 1985* *($000)*	*All Stockholders* *Dec. 31, 1985* *($000)*	*Outside Stockholders* *Dec. 31, 1985* *($000)*	*Treasury Stock* *Dec. 31, 1985* *($000)*	*Partial Treasury Stock* *Dec. 31, 1985* *($000)*
INCOME STATEMENT					
Operating Profit	150	150	150	150	150
Investment Income					
Dividend From B	12				
Equity Income From B	0	54	13	42	42
Net Income	162	204	163	192	192
STATEMENT OF RETAINED EARNINGS					
Balance, Jan. 1	430	430	430	430	430
Net Income	162	204	163	192	192
	592	634	593	622	622
Dividends Paid	−30	−30	−30	−30	−30
Dividend Adjustment	0	9	6	2	0
Balance, Dec. 31	562	604	569	594	592
BALANCE SHEET					
Investment in B					
Cost	120	120	120	120	120
Equity Increase	0	54	13	42	42
Reciprocal Holding Adjustment	0	0	−10	−3	0
Dividend	0	−12	−12	−12	−12
Dividend Adjustment	0	0	6	2	0
	120	162	117	149	150
Operating Assets	1,132	1,132	1,132	1,132	1,132
Total Assets	1,252	1,294	1,249	1,281	1,282

TABLE 2—*Continued*

Company A	*Cost Dec. 31, 1985 ($000)*	*All Stockholders Dec. 31, 1985 ($000)*	*Outside Stockholders Dec. 31, 1985 ($000)*	*Treasury Stock Dec. 31, 1985 ($000)*	*Partial Treasury Stock Dec. 31, 1985 ($000)*
Common Stock ($1 Par)	50	50	50	50	50
Reciprocal Holding Adjustment	0	0	−10	−3	0
	50	50	40	47	50
Retained Earnings	562	604	569	594	592
Stockholders Equity	612	654	609	641	642
Liabilities	640	640	640	640	640
Total Equities	1,252	1,294	1,249	1,281	1,282
RATIOS					
Earnings per share	$3.240	$4.085	$4.085	$4.085	$3.840
Operating income/opening operating assets	15%	15%	15%	15%	15%
Net income/opening stockholders' equity	34%	43%	34%	40%	40%

Note: Details of income calculations are shown in Appendix A.

assumed that dividends remain constant. The results of Company B are not shown in this table as the methods may be adequately illustrated by looking at only one of the companies involved in the reciprocal relation.

Cost Method. This method is included only as a point of reference as it is not a method of equity accounting. The investment is reported in the balance sheet at historical cost and investment income in the income statement consists only of dividends received from the investee.

All Stockholders Method. As explained earlier, the problem with reciprocal holdings is that the net income of Company A is dependent, in part, on its share of Company B's income. In turn, Company B's net income is dependent, in part, on its share of the income of Company A. The most direct arithmetical solution is to use simultaneous equations. However, this approach assumes a hypothetical distribution of operating income by each company: 20 percent of Company A's operating income to Company B and 30 percent of Company B's operating income to Company A. The amounts "received" from these distributions are assumed to be redistributed. Thus, Company A "redistributes" to Company B 20 percent of the 30 percent it received from Company B on the first round, and Company B "redistributes" to Company A 30 percent of the 20 percent it received first time around. Redistribution continues until eventually there are no further significant amounts to be redistributed. Investment income for each company includes all the hypothetical distributions received. This leads to the criticism that profits are double-counted under this method.

We call this the "all stockholders" method, because, as the name suggests, companies using this method report to all stockholders regardless of identity or degree of ownership. Thus, Company A reports a total net income of $204,255 (as calculated in Appendix A), including $54,255 equity investment income, to holders of all 50,000 shares. In the balance sheet, the book value of the investment in B is increased by the equity income less dividends received from Company B.

Outside Stockholders Method.[5] Companies using this method report to the holders of non-mutually held stock. Net income is initially calculated as per the all stockholders method and then the earnings applicable to the mutual stockholding are eliminated. As Company B owns 20 percent of Company A, 20 percent of Company A's income is eliminated. Thus, under this method Company A reports total net income of $163,404, including $13,404 of equity investment income, attributable to the 40,000 shares held by outside stockholders.

In recognition of the effective reduction of capital, adjustments are made in the statement of retained earnings to dividends paid and, in the balance sheet, to the common stock account and the investment account. The amount of the adjustment to the asset account, as shown in Table 2, is 20 percent of paid-up capital and dividends paid. These adjustments may result in the investment account being reduced to below cost, as in Table 2.

APB Opinion 18 [Accounting Principles Board, 1971, par. 19] provides some support for the outside stockholders method as it requires the equity accounted results to be the same as if the results were consolidated. However, it seems that mutual and multiple ownership were not considered when APB 18 was being drafted [Weil, 1973]. In a hypothetical consolidation of Companies A and B, Company A may be viewed as having purchased its own shares through the agency of Company B. Thus, any shares B holds in A are effectively no longer issued from A's point of view. The validity of this assumption is questionable in the case of non-controlled associate companies.

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[5] In connection with subsidiaries acquiring stock in their parent companies, this method is often described in American accounting texts as the "traditional" or "conventional" method.

Treasury Stock Method. This method acknowledges the "shadow" set of stockholders which exists behind the mutually held stock. The shadow set is the indirect "outside" stockholding [Petri and Minch, 1974]. If A owns 30 percent of B, and B owns 20 percent of A, then, effectively, A owns six percent of itself. The direct outside stockholding in Company A is the 40,000 shares in A not held by Company B. The indirect outside stockholding is the 7,000 shares in A held by stockholders in Company B apart from Company A (70 percent of 10,000 shares). Once again, the reporting entity is regarded as having effectively purchased a proportion of its own stock, although the proportion is different from that calculated under the outside stockholders method which ignores the indirect outside stockholding.

Under the treasury stock method, Company A reports to the direct and indirect holders of 47,000 shares income calculated by aggregating A's operating income and 30 percent of B's operating income (excluding any equity or dividend income from A). Thus, Company A reports equity income of $42,000. As with the outside stockholders method, adjustments are made to dividends, stockholders' equity, and the investment account in A's balance sheet to adjust for the effective repurchase of six percent of its own shares.

Moonitz [1939] notes that the similarity between reciprocal stockholdings and treasury stock was recognized by the Courts as long ago as 1902. Further support for the treasury stock method of accounting for reciprocal investments between subsidiary and parent companies is found in ARB 51 [AAA, 1959, par. 13].

The "partial treasury stock" method included in Table 2 is a partial application of the treasury stock approach. Income is the same as under the treasury stock approach but no adjustment is made to dividends paid or to capital (except possibly for the purposes of calculating EPS). This method has been included because of its use in New Zealand.

Reconciliation of the Alternative Methods

The amount of income and capital reported depends upon, first, the nature of the reporting group and, second, the identity of the stockholders for whom the reports are being prepared. The nature of the reporting group determines whether any income and capital adjustments should be made in recognition of the reciprocal relations. The identity of the stockholders determines the amount of any required adjustments.

Before looking at the particular problem of equity accounting for reciprocal stockholdings, consider the situation if the reciprocal holdings do not exist. If one assumes that Company A owns 30 percent of Company B and that Company B does not own any stock in A, Company A reports total income of $162,000 using the cost method of accounting for the investment (operating income of $150,000 plus dividend income of $12,000). Company B reports total income of $140,000, and the combined total of the two companies' incomes is $302,000. This, of course, ex-

TABLE 3
SUMMARY OF REPORTED RESULTS

	Company A			Company B		
	*Net Income**	*Number of Shares*	*EPS*	*Net Income**	*Number of Shares*	*EPS*
Cost	$162,000	50,000	$3.24	$146,000	40,000	$3.65
All Stockholders	$204,255	50,000	$4.09	$180,851	40,000	$4.52
Outside Stockholders	$163,404	40,000	$4.09	$126,596	28,000	$4.52
Treasury Stock	$192,000	47,000	$4.09	$170,000	37,600	$4.52
Partial Treasury Stock	$192,000	50,000	$3.84	$170,000	40,000	$4.25

* The operating income for Company A is $150,000 and Company B is $140,000, under all methods.

ceeds the total of the two companies' operating incomes. This is not a problem because each company is considered to be an independent entity reporting to its own stockholders. Similarly, if equity accounting is used by Company A, it will report income of $192,000 and B, income of $140,000. The total will be $332,000, again in excess of the combined operating incomes. Only if the two entities are consolidated and report as one entity to their outside stockholders will total reported income equal total operating income.

Choosing a method of equity accounting when reciprocal holdings exist forces a decision as to the nature of the reporting group and the identity of the stockholders to whom the group reports. Returning to our original example, Table 3 contains a summary of the reported results for both Companies A and B employing the methods outlined in this section of equity accounting when reciprocal stockholdings exist.

From Table 3, it can be seen that only the outside stockholders method produces aggregate net income for the two companies equal to the total of their operating incomes. The all stockholders method essentially ignores the reciprocal holdings and, therefore, treats the two companies as independent reporting entities. Each company reports to its own stockholders regardless of their identity. The outside stockholders method reports the same aggregate income and the same capital that would be reported if Companies A and B were consolidated and reported as one entity to their combined set of outside stockholders. In effect, intercompany investment income is now considered to be an intra-group transaction which should be eliminated. This leads to the result that if the two companies are actually reporting as separate entities, and one company reports positive equity investment income, the other must report negative equity income. The treasury stock method recognizes the reciprocal holdings, but assumes that in other respects they are independent entities which have some stockholders in common, i.e., Company A reports to its own stockholders and to the stockholders in B who have an indirect interest in A.

As can also be seen, although total income and number of shares may change, the earnings per share is the same under the all stockholders, outside stockholders, and treasury stock methods. Because the partial treasury stock method recognizes the reciprocal stockholdings in the income statement but not in the balance sheet, it produces an incorrect earnings per share figure.

Until reciprocal holdings between two or more associated companies became more frequent, policy makers were able to avoid stating the underlying conceptual basis of equity accounting. The recent increase in reciprocal holdings between associated companies in New Zealand has meant that the New Zealand Society of Accountants has no longer been able to ignore this problem.

During the 1980's, New Zealand has witnessed much merger and takeover activity in response to changing economic conditions and closer economic relations with Australia. Legal restrictions on merger activity in New Zealand prevent mergers in certain industries without the approval of a government body called the Commerce Commission. However, companies have been permitted to acquire up to 25 percent of the capital of another company before seeking approval. The New Zealand standard on equity accounting states that, *prima facie*, a holding of 20 percent or more in another company entitles the investor to account for the income of the investee on an equity basis.

These two factors have meant that a typical first step for a company intending to take over another company has been to acquire on the Stock Exchange a holding of between 20 and 24.9 percent in the target company. As a defensive strategy, some target companies have purchased equivalent stockholdings in their attacker. The result has been an increase in reciprocal holdings between associated companies leading to the problem of deciding how the income from these investments should be measured. The next section illustrates how this problem was addressed by three New Zealand companies.

THE ACCOUNTING ISSUE—AN ILLUSTRATION

In 1981 New Zealand's leading food processor, Wattie Industries Ltd., purchased a 24.9 percent holding in Goodman Group Ltd., a major cereal miller and baker. At the same time, Goodman Group Ltd. acquired in excess of 22 percent of Wattie. In late 1983 Wattie and Goodman, through the medium of a company they jointly owned 50/50, purchased approximately 24.9 percent of the capital of another major New Zealand company, New Zealand Forest Products Ltd. (NZFP). As a defensive measure, NZFP retaliated by acquiring a similar interest in Wattie and approximately six percent of Goodman. NZFP then initiated a full takeover offer for all the stock in Wattie which Goodman did not own. Subsequent discussions between the directors of the three companies led to the withdrawal of NZFP's offer, but NZFP remained a stockholder in both Goodman (six percent) and Wattie (24 percent). Goodman later sold its holding in NZFP to Wattie. These investment levels fluctuated between 1981 and 1985, but remained at a level sufficient to justify the use of equity accounting.[6] The reciprocal holdings as at March 31, 1985 are set out in Figure 1.

The annual reports of these companies over the period 1981 to 1985 show a variety of methods used to calculate the amount of equity income. All these methods were approved by the particular auditors concerned. Despite criticism voiced by financial analysts, however, the accounting policy makers vacillated over a solution.

In its 1981 Annual Report to Stockholders, Goodman Group reported that it employed the following variation of

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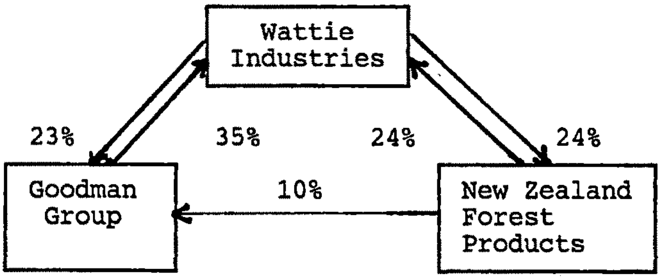
[6] Goodman later formed a further reciprocal alliance with an Australian company, Elders IXL Ltd.

FIGURE 1

RECIPROCAL RELATIONS: MARCH 31, 1985



the equity method of accounting to report its share of Wattie's profits.

> The retained earnings in Wattie Industries Ltd. *excludes that company's equity share in Goodman Group Ltd. profits* for the period ending 31st March 1981. (emphasis added)

As no balance sheet adjustments were made, Goodman Group's policy is that described as the partial treasury stock method in the previous section. This method was also adopted by Wattie in its 1981 annual report. This approach complies with the New Zealand standard on equity accounting which provides that when employing equity accounting, appropriate adjustments should be made to avoid double counting of income [NZSA, *SSAP 2* 1979, par. 4.5].

In 1982, the two companies continued to use the same policy. However, by 1983, Wattie was becoming concerned with the results reported under this method. As we have seen, the partial treasury stock method results in an understatement of earnings per share. Furthermore, Wattie's associates borrowed to finance their intercorporate investments. Wattie noted in their annual report in 1983 that it was possible for dividends from associates to exceed the equity income reported under the treasury stock method to the extent that an equity loss could be reported if the associate's holding cost of the investment exceeded other earnings. Wattie's associates do not appear to have been faced with the same problem because Wattie apparently did not borrow in order to fund its corporate investments.

Wattie sought the advice of the Accounting Research and Standards Board of the New Zealand Society of Accountants (NZSA). This was a new problem in New Zealand. Unlike the United States, companies cannot redeem or reacquire any of their own outstanding ordinary stock. This prohibition extends to a subsidiary acquiring stock in its parent. Thus, there had been no previous experience of accounting for reciprocal holdings between parent and subsidiary companies.

The alternatives examined included the all stockholders method and the outside stockholders method. As we have seen, the latter method can report greatly reduced income statement and balance sheet results and was not seen as a helpful solution. The all stockholders method appeared to provide the correct arithmetical solution.

Wattie's 1983 annual report adopted

the all stockholders method, described as follows:

> Where an associate company holds an equity interest in a group company the group's share of the associate's retained earnings is calculated by taking into account the progressive additions to the associate's income arising from their interest in the group company.

Concerning the calculation of EPS, the 1983 annual report states that the new method:

> . . . yields the same earnings per share that would be obtained by consolidating the associate and treating its outside shareholders as a minority interest.

However, as we have previously noted, it is only the partial treasury stock method which understates earnings per share because of its failure to make the balance sheet adjustments corresponding to those made in the income statement. The earnings per share is the same under all the other equity accounting methods.

It was not until the following year (1984) that Wattie noted that the method adopted in 1983 represented a departure from the New Zealand standard on equity accounting. However, the 1984 report states that the departure was made with the agreement of the company's auditors and the Financial Accounting Committee of the Accounting Research and Standards Board. In 1984 NZFP reported its reciprocal arrangement for the first time and adopted the all stockholders method. Goodman Group's accounting policy during this period continued to be the partial treasury stock method, although, in 1985, the Group began to make appropriate adjustments when calculating EPS.

In early 1985, the NZSA advised that it was no longer prepared to concur with the use of the all stockholders method. Equity accounting, in general, was coming under increasing criticism by the financial analysts, and the all stockholders method, with its apparent double counting of profits, was a prime target for the analysts [Wise and Wise, 1985, p. 17]. Furthermore, with the increased use of reciprocal holdings and an impending review of the New Zealand standard on equity accounting, the problem had become increasingly important. The NZSA now indicated a preference for a method it called the "treasury stock equivalent" method.[7] This method is derived from the method developed in the United States to deal with the problem of accounting for reciprocal stockholdings between parent and subsidiary companies. The Chairman of the New Zealand Securities Commission, a vocal critic of equity accounting, expressed support for the new method [Patterson, 1985]. Neither Wattie nor NZFP adopted the treasury stock method in 1985 but the approach adopted by Goodman Group in its 1985 accounts for calculating EPS (described earlier) reflects the underlying philosophy of the treasury stock method.

This section has demonstrated the diversity of approaches to the problem of equity accounting when reciprocal stockholdings exist. Even firms within the same bilateral relation adopted different accounting policies. While the New Zealand Society of Accountants' views on this issue turned full circle, the auditors continued to support their clients' policy choices in the absence of a formal recommendation. The difficulties faced by policy makers and practitioners with respect to equity accounting for reciprocal stockholdings arose because the conceptual basis of equity accounting has not been clearly delineated. The conceptual issues are discussed in the next section.

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[7] This method subsequently became known simply as the "treasury stock" method, and is referred to as such in this paper.

CONCEPTUAL IMPLICATIONS

Equity accounting was originally developed as an alternative to the cost basis of recording holding company investments in subsidiaries. However, with the popularization of the consolidation technique, the equity method declined in importance until concern in the United States over the frequency with which firms omitted subsidiaries from their consolidated statements led to ARB No. 51 and APB Opinion No. 10 supporting the use of the equity method of accounting for unconsolidated subsidiaries in consolidated reports. Subsequently, the use of the equity method has been extended to cover other investments including associated companies.

The rationale of consolidated financial statements lies in the control exercisable by the investor company over the consolidated investees and their resources. Consolidation may be viewed as a response to the problem of accounting for a group of companies unified by the control vested in the holding company stockholders. Traditionally, control has been indicated by ownership of a majority of stock in subsidiary companies, but broader definitions have been proposed.[8]

It is recognized that when one company is able to direct the affairs of a number of other companies, information is needed about the financial affairs of the group of companies as an economic entity. Consolidation techniques involve substituting the underlying assets and liabilities of the subsidiary for the investment asset so that these may be aggregated with those of other members of the group. Consolidated profits are the total of the individual companies after elimination of the effects of intra-group transactions. However, where there are minority interest stockholders it is necessary to decide whether the reported profits of the group should include those attributable to the minority interest stockholders.

The Accountants International Study Group [1973] and others (for example, Nobes and Parker [1981] and Walker [1978]) have usefully distinguished between consolidation procedures based on the parent company concept (in which emphasis is given to the equity stockholders of the parent company) and the entity concept (in which equal importance is given to both parent and minority stockholders). In other words, the group of companies may report only to the parent company stockholders or to both the parent and minority interest stockholders. This distinction has important procedural implications.

If the group reports only to parent company stockholders (parent company concept), it is necessary to separate the interests of the parent stockholders from those of the minority stockholders. Usually, this is achieved by reporting 100 percent of the assets and liabilities of the subsidiary in the consolidated balance sheet and showing the percentage interest of the minority stockholders in the net assets of the subsidiary as a quasi liability. Similarly, in the income statement, the proportion of new income at-

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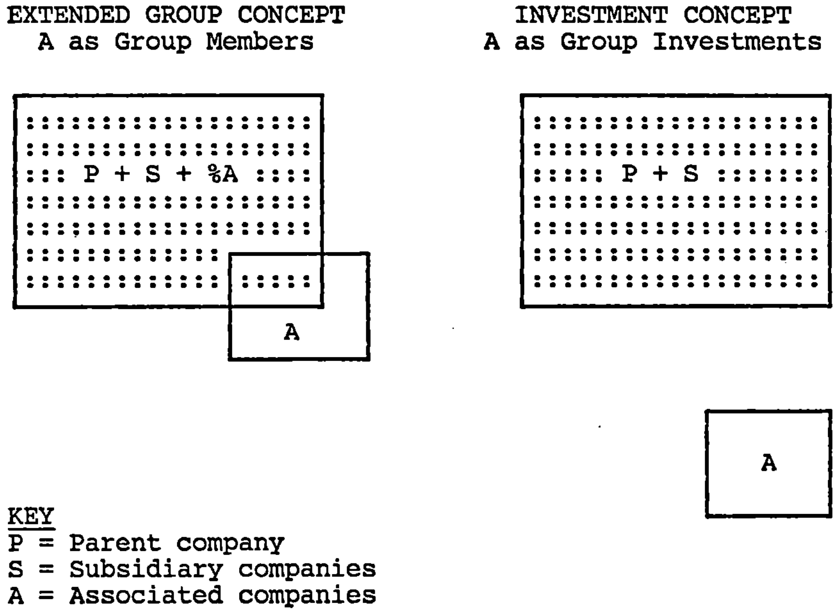
[8] For example, the FASB has tentatively concluded, in its project on the reporting entity, that the concept should be based primarily on control rather than on ownership of a majority voting interest [FASB, Dec. 1986]. See, also, Choi and Mueller [1986, p. 216].

FIGURE 2
VIEWS OF EQUITY ACCOUNTING



tributable to minority stockholders is deducted as a quasi expense to arrive at group net income.[9]

If the group reports to both parent and minority interest stockholders (the entity concept), no deduction for minority interest is necessary in the income statement because group profit is the total attributable to all stockholders. Similarly, minority interest is not separated out in the balance sheet and is shown as part of stockholders' funds.

To summarize, when one company is able to exercise control over another, consolidation accounting ignores the legal boundaries between the separate entities and views them as members of a single reporting group, the exact boundaries of which depend upon definition of the term "control." This group may report only to the parent company stockholders or to both parent and minority stockholders. In most countries the former (parent company) concept is adopted.

Equity accounting may be viewed as a method of accounting for an extended group which comprises, in addition to the "controlled" companies (whether defined as being based on majority stock ownership or on some broader definition of control), non-controlled companies which are subject to "significant (but not controlling) influence" (extended group concept). However, another view is that equity accounting does not postulate any extension of the group entity and that the latter companies are not members of the reporting group. Equity accounting is considered to be merely an improved method of accounting for a long-term investment held by the group (investment concept). These two views of equity accounting are illustrated in Figure 2.

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[9] Another technique that is based on the parent company concept is proportional consolidation. Under the procedures employed using this technique, the parent company consolidates its proportional share of the financial statements of the investee company(ies).

Under the extended group approach, equity accounting is viewed as a one-line consolidation resulting in a set of accounts which more faithfully represents the results of the group of which the associated companies are a part. The item "interest in associated companies" does not represent an investment, but rather the group's interest in the underlying net assets of the associate. The assets are not integrated on a line by line basis with those of the other members of the group. It has been argued that this enables users of the accounts to distinguish the net assets under the control of the group from those over which the holding company has only significant influence [Leo and Best, 1974, p. 605].

The alternative investment concept does not postulate any extension of the group entity. It merely considers equity accounting to be more informative than simply reporting dividend income and an appropriate method of accounting for certain long-term investments provided some safeguards are adhered to. Such safeguards have usually included the elimination of all inter-company transactions as in the consolidation process. This recognizes that some transactions may not be entirely at arm's length.

The Australian standard on equity accounting, AAS 14 [Australian Society of Accountants, 1984], appears to be the only standard in the English-speaking world to expressly define the nature of the reporting entity with respect to associated companies. In paragraph 3 it states:

> The reporting entity recognised in (conventional) group accounts reflects the inter-relationship between a number of legal entities which has arisen from the holding of shares by the holding company, directly or indirectly, in companies within the group. This Statement builds on that concept by defining a reporting entity which in addition to the investor and any subsidiaries of the investor, embraces the investor's ownership interest in associated companies. This reporting entity has, for the purposes of this Statement been termed an "economic entity."

The adoption (explicitly or implicitly) of either view of the equity accounting process has important implications for the general application of the equity accounting method: e.g., which transactions between an investing company and an associate should be adjusted. This question has still not been resolved because of the lack of agreement on the underlying rationale of equity accounting. If the equity accounting method is considered to be a "one-line consolidation," all intra-group transactions need to be taken into account in determining the overall results of the extended group entity. On the other hand, the "investment" approach to equity accounting leads one to argue that if transactions are at arm's-length there is no need to eliminate so-called "unrealized" profits [Samuels, Rickwood, and Piper, 1981, p. 127].

The lack of agreement on the underlying rationale of equity accounting acquires special significance when reciprocal stockholdings exist. As previously explained, both the "outside stockholders" and the "treasury stock" methods involve reciprocal holding adjustments which reduce the common stock of the investor by the effective amount of the investor's reduction in capital. The existence of these adjustments means that both these methods must be applications of the extended group approach to equity accounting. The methods differ with respect to the amount of capital eliminated because they each report to a different group of stockholders.

The treasury stock method assumes that the associated company acts as an "agent" for the investor in acquiring the investor's stock and, thus, the "parent" company has effectively reacquired its own shares. Therefore, these shares do not participate in the allocation of the investor's own earnings. In effect, the treasury stock method is an application of the parent concept of consolidation accounting, where the stockholders reported to are the direct and indirect stockholders in the parent company.

The outside stockholders method also recognizes the reciprocal arrangement. However, it implicitly adopts an entity approach to consolidation accounting as it ignores the fact that there is more than one reporting entity and views all investment income as being intra-group. The incomes reported by the entities within a "group" sum to the operating income which would be reported if all the companies reported as a single entity. Each company within the "group" reports only to its own outside stockholders so that, in total, all companies report to only outside stockholders of the group.

Thus, although the treasury stock and outside stockholders methods may be regarded as being consistent with the extended group concept of equity accounting, they produce different results because they report to different sets of stockholders. The treasury stock method is preferable within the context of the extended group as it recognizes the indirect interest in the parent company held by the stockholders in the associate.

The all stockholders method reports to all stockholders in the reporting entity, without regard to the identity, composition, or degree of ownership. No recognition is given to the reciprocal relation and so this method is consistent with the investment concept of equity accounting. One of the most frequent criticisms of this method is that it "double counts" profits. This so-called "double-counting" can be explained by noting that in a reciprocal situation each company's net income includes its own operating results several times—once as its own operating results and again as investment income from other companies whose stock is mutually held. This double counting can be criticized only if an extended group approach to equity accounting is assumed. The all stockholders method would seem to be a logical consequence of equity accounting under the investment concept.

The parallels with consolidation accounting issues are clear. There are two questions to be answered in both consolidation accounting and equity accounting. First, what are the boundaries of the reporting entity? Second, to whom is that entity reporting? Because the boundaries of the reporting entity have been traditionally established by resort to legal measures of control for consolidation purposes, the focus in consolidation accounting has usually been on the second issue. It has often been assumed in the literature that equity accounting is just another form of consolidation accounting and, therefore, this important first issue has rarely been addressed. Failure to distinguish the two issues and to recognize that the second question arises only after the first issue has been resolved, has added to the confusion surrounding the problem of accounting for reciprocal associated stockholdings.

Conclusions

The diversity of methods adopted to calculate the amount of an investee's net income to be recognized by the investor using the equity method when reciprocal stockholdings exist reflects the underlying confusion over the basic rationale for equity accounting. Equity accounting may be viewed as a means of extending the concept of the group entity beyond the bounds of control and into the area of significant influence. On the other hand, it may simply be regarded as an improved means of reporting the results of an investment held for the long-term where the investor takes an active (but not a controlling) role in the decision-making of the investee company. If the former view is adopted then it is necessary to identify the group of stockholders to whom the extended group should report. This second issue does not arise in the case of the investment concept as the reporting entity remains the investing company which reports to its own stockholders.

These different views of equity accounting have important implications for general equity accounting procedures, but acquire special significance when the problem of reciprocal holdings exists. If an extended group approach is adopted, we believe the best approach is the treasury stock method. If an investment approach is adopted, the only equity accounting solution is the all stockholders method. However, we note that the APB considered that the use of market values for recording investments met most closely the objective of reporting the economic consequences of holding an investment [APB, 1971]. The market value method is consistent with the investment approach and may be preferable to equity accounting.

An evaluation of the relative merits of the extended group approach versus the investment approach to equity accounting is beyond the scope of this paper. Our objective was simply to point out the existence and significance of these previously unrecognized competing theories of equity accounting. The procedural implications of these different theories are sufficiently important to necessitate the explicit statement of the underlying philosophy in any standard on equity accounting.

APPENDIX A

ALTERNATIVE METHODS OF EQUITY ACCOUNTING FOR RECIPROCAL HOLDINGS: NET INCOME CALCULATIONS

All Stockholders Method

This method reports to all stockholders of each company, regardless of identity of the stockholders. That is, Company A reports net income of $204,255 to 50,000 shares, calculated as follows:

Let A = net income for Company A.
B = net income for Company B.

$A = \$150{,}000 + .3(B)$
$B = \$140{,}000 + .2(A)$

Then

$$A = \frac{\$150{,}000 + .3(\$140{,}000)}{1-(.3)(.2)} = \$204{,}255. \qquad B = \frac{\$140{,}000 + .2(\$150{,}000)}{1-(.2)(.3)} = \$180{,}851.$$

Outside Stockholders Method

Under this method, Companies A and B report only to the outside or non-mutually held stockholders, calculated as follows:

	Company A	*Company B*
Number of shares issued	50,000	40,000
Mutually held shares	10,000	12,000
Outside stockholding	40,000	28,000

Thus, Company A reports net income of $163,404 [$204,255(40/50)] to the owners of 40,000 shares. Similarly, Company B reports a net income of $126,596 to 28,000 shares.

Treasury Stock and Partial Treasury Stock Methods

This method distinguishes between the direct and indirect stockholding in the mutually held shares. Under this method the outside interest being reported to is:

	Company A	*Company B*
Number of shares issued	50,000	40,000
Treasury stock	3,000	2,400
Outside interest	47,000	37,600

Company A reports net income of $192,000 [$204,255(47/50)] to the owners of 47,000 shares. *B* reports net income of $170,000 to 37,600 shares. Alternatively, the income of *A* and *B* can be calculated as follows:

$$A = \$150{,}000 + .3(\$140{,}000) = \$192{,}000. \qquad B = \$140{,}000 + .2(\$150{,}000) = \$170{,}000.$$

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Reporting Consolidated Gains and Losses on Subsidiary Stock Issuances

Michael L. Davis and James A. Largay, III

ABSTRACT: For years the SEC had required companies that experienced increases in their equity in subsidiaries due to a subsidiary stock issuance to enter that increase (or "gain") in Paid-In Capital. In 1983, the SEC changed its views on this issue in *Staff Accounting Bulletin No. 51* [SEC, 1983]. Following the conclusions of an AICPA *Issues Paper* on the subject, the Commission decided to offer companies the *option* of reporting such gains from subsidiary stock issuances *either* in capital *or* in income in consolidated financial statements. This treatment was later extended to stock issuances of nonconsolidated equity investees, and companies began reporting these gains in income.

This paper critically examines the view taken in the *Issues Paper* and reflected in *SAB 51*, that gains on subsidiary stock issuances are similar in substance to gains realized when the parent sells part of its investment in the subsidiary. It also reports on the treatment of these transactions in practice—and the window-dressing potential—by companies reporting them.

We conclude that while a subsidiary stock issuance is similar in many respects to a parent's sale of its subsidiary's stock, there are important differences. Moreover, the proper accounting may depend on the theory of consolidation adopted. Public reporting of these transactions is often inadequate, particularly with respect to tax effects (an unsettled area in which standard-setting may be needed) and footnote disclosure.

IN March 1983, the Securities and Exchange Commission issued *Staff Accounting Bulletin No. 51* (*SAB 51*) [SEC, 1983], which permits—but does not require—recognition of gains or losses arising from stock issuances by subsidiaries as nonoperating *income* items rather than *capital* transactions in consolidated statements. This treatment follows the recommendation of the AICPA *Issues Paper*, "Accounting in Consolidation for Issuances of a Subsidiary's Stock" [AICPA, 1980]. Later the SEC extended use of the new treatment to stock issuances by nonconsolidated equity investees.

Prior to *SAB 51*, the SEC had required that gains resulting from these types of transactions be entered in Additional Paid-In Capital, not in the income statement [Rappaport, 1972, p. 18.28]. An article in *The Wall Street Journal*

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Michael L. Davis is Assistant Professor of Accounting, and James A. Largay, III, is Arthur Andersen & Co. Alumni Professor of Accounting, both at Lehigh University.

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[Berton, 1984] zeroed in on the controversial nature of the change by observing that:

- A parent company could record a gain when *it* sells stock of a subsidiary; why not record the same gain when stock issued by the *subsidiary* increased the value of the company's cash or assets?
- Accounting should not permit the misleading practice whereby a parent recognizes a gain when the subsidiary issues stock while the subsidiary does not.

Since release of *SAB 51* in 1983, many companies have reported large gains from subsidiary stock issuances and may have engaged in window-dressing the income statement by not recognizing the potentially unfavorable tax effects. Several companies reported such gains in two consecutive years. We found two firms that reported them in three consecutive years. Most were material transactions, often with flawed disclosures.

In addition, the magnitude may be rising. The largest gain identified in our sample period was $54.7 million. Subsequent to our data analysis, the public stock offering by Coca-Cola Enterprises, Inc. in November 1986, supplied The Coca-Cola Company with a gain of $375 million. No taxes were provided on this gain, which turned Coke's operating loss into a profit of $314.5 million for the fourth quarter of 1986. The gain also accounted for 40 percent of Coke's entire net income in 1986; its omission would have resulted in 1986 net income falling below that reported in 1984 and 1985.

Emerson Radio Corp.: An Example

To illustrate both the magnitude and frequency of these transactions, consider the case of Emerson Radio Corp. Emerson reported a gain of $6.6 million in 1983 when stock was issued by Cardiac Resuscitator Corporation, one of Emerson's subsidiaries. This gain erased what would have been a $3.5 million net loss and instead produced net income of $3.1 million. During the next year, 1984, this same Emerson subsidiary issued *more* stock, resulting in a further gain of $.5 million to the parent. In addition, a gain of $5.4 million was reported in 1984 from a stock issuance by Imatron, Inc., *another* Emerson subsidiary. These gains increased Emerson's 1984 net income by 85.7 percent, from $4.9 million to $9.1 million.

One reason for the larger impact on income in 1983 was that, contrary to a recommendation in the 1980 *Issues Paper*, Emerson Radio failed to provide taxes on the 1983 gain or on the $.5 million gain in 1984. The entire $6.6 million gain flowed to the bottom line in 1983 and the tax provision was materially understated. No explanation was given in the 1984 Annual Report as to why taxes were provided on the gain from one subsidiary's stock issuances and not provided on another's. Moreover, contrary to the reporting requirements of *SAB 51*, Emerson neglected to clearly designate these gains as *nonoperating income.*

For these reasons, and because of the unusual nature of the new treatment and the potential for window-dressing in the income statement, this paper critically analyzes the subject. We begin by discussing the theoretical controversy related to accounting for stock issuances by subsidiaries. Then we present examples from practice and evaluate compliance with *SAB 51*'s requirements.

THE THEORETICAL CONTROVERSY

The theoretical controversy arises be-

Exhibit 1

Assume that Company S has 1,000 shares issued and outstanding. Company P owns all of these shares carried at equity of $50,000 or $50 per share. Company S issues 250 additional shares to investors outside the group. Using three different offering prices, the results are:

	Offering Price		
	$40/share	*$50/share*	*$60/share*
S Company's equity prior to stock issuance	$50,000	$50,000	$50,000
Offering proceeds	10,000	12,500	15,000
S Company's equity after stock issuance	$60,000	$62,500	$65,000
P Company's new equity in S Company (80% = 1000/1250)	$48,000	$50,000	$52,000
P Company's old equity in S Company (100 percent)	50,000	50,000	50,000
Increase (decrease)	$(2,000)	$ 0	$ 2,000

cause a parent (P) company can raise cash and reduce its ownership interest in a subsidiary (S) in two alternative ways: (1) by selling some of the S shares it currently owns, or (2) by directing S to sell some of its previously unissued or treasury shares. A gain (or loss) on the books of the parent can obviously arise from the first alternative. In addition, a gain (or loss) can also result from the second alternative when S sells the shares to investors outside the consolidated group: while P's ownership percentage declines, the carrying value of P's equity in S's net assets increases (decreases) if the stock is sold for more (less) per share than the average carrying value of the shares owned by P. Exhibit 1 illustrates these points.

Prior to the 1980 *Issues Paper*, no authoritative pronouncement addressed the proper accounting for the changes in P's equity in S as shown in Exhibit 1. There are two theoretical questions: (1) are transactions involving the sale of shares held by a parent company in a subsidiary company *similar* or *dissimilar* to transactions involving the issuance of additional shares by the subsidiary itself; and, (2) independent of which party sells (issues) shares, is the transaction an *income* or a *capital* item? How one answers question (1) is influenced by analysis of the pertinent economic issues, discussed next. Question (2) may be answered after consideration of alternative consolidation theories, which we discuss in a subsequent section.

Economic Issues

To assess the substantive similarity or dissimilarity of parent stock sales and subsidiary stock issuances, we examine the three principal economic issues mentioned in the *Issues Paper*.

Culmination of the Earnings Process. A classical test for revenue recognition is that the related earnings process be substantially complete. Some of those who contributed to the *Issues Paper* believed that P's "earnings process" is complete if it sold the shares and not complete if S

EXHIBIT 2

Using data from column 3 of Exhibit 1, recall that P carries all 1,000 shares of S at equity of $50,000, prior to a sale of shares by P or issue by S at $60/share. With the two separate parent company objectives of maintaining either the *same number of shares* or the *same percentage of ownership interest*, the results are:

	Same Number of Shares		*Same Percentage of Interest*	
	P Sells 250 Shares	*S Issues 250 Shares*	*P Sells 200 Shares*	*S Issues 250 Shares*
Cash received	$15,000	$15,000	$12,000	$15,000
P's percentage of interest in S:				
750/1,000	75%	—	—	—
800/1,000	—	—	80%	—
1,000/1,250	—	80%	—	80%
Increase in consolidated assets	$15,000	$15,000	$12,000	$15,000
Increase in consolidated net worth:				
Parent theory	2,500[1]	2,000[2]	2,000[3]	2,000[2]
Entity theory	15,000	15,000	12,000	15,000
P's gain	2,500[1]	2,000[2]	2,000[3]	2,000[2]

[1] 2,500 = 15,000 − .25 × 50,000.

[2] 2,000 = .8(50,000 + 15,000) − 50,000.

[3] 2,000 = 12,000 − .2 × 50,000.

sold the shares, even though P's percentage interest decreases in either case. Yet *SFAC 5* [FASB, 1984] on recognition and measurement issues indicates in par. 83(b) that *gains* are not likely to result from an "earnings process" (unlike *revenues* from central operating activities) and that recognition of gains is usually triggered solely by *realization* (exchange for cash or claims to cash). Because sale of S's shares by *any* member of the consolidated group (and concurrent realization) causes the key reduction in P's ownership percentage in S, it appears that culmination of an earnings process is no longer a determining factor.

Size of the Consolidated Entity. Size must be considered both in terms of consolidated assets and consolidated net worth. Whether P sells some of its S shares, or S issues an equal number of shares at the same price, the resulting consolidated *assets* are the same. This happens because in both cases the P and S entity has the cash from the stock sale and P's Investment in S account is eliminated in consolidation. Consolidated *net worth*, however, may increase by the entire proceeds, increase partially, or decrease, depending upon the consolidation theory used (the parent theory of consolidations excludes the minority interest from consolidated net worth while the entity theory of consolidations includes it). Moreover, when the same number of shares is used in the two situations, P's resulting ownership percentage in S is *lower* if P sells the shares.

If P seeks the *same percentage interest* in S, more shares will have to be sold when S does the selling. This in turn produces *more* consolidated assets, with the amount related to the magnitude of the change in P's interest. Exhibit 2 will help illustrate these points.

Note that consolidated assets are affected only by the number of shares sold and the per share price, not by the identity of the seller. When P retains an 80 percent interest, as in the right-hand columns of Exhibit 2, the increase in consolidated assets is 25 percent higher when the shares are sold by S rather than P. Yet if P were to sell 400 shares and retain only a 60 percent interest, S would have to sell 667 [=(1,000/.6)−1,000] shares and the increase in consolidated assets would be 67 percent [=\$60×(667 −400)/(\$60×400)] higher when S sells the shares.[1]

The change in consolidated net worth agrees with the change in consolidated assets when reported pursuant to the entity theory. Under the parent theory, the change in consolidated net worth equals P's *gain*, not the change in consolidated *assets*.

Income Tax Considerations. When the parent sells some of its shares of a subsidiary to outsiders, any resulting gain or loss is usually taxable during the current period. *Issuance* of stock by a subsidiary (or any corporation), however, is never a taxable event to the issuer because it is viewed as a capital, and not revenue, transaction by the Internal Revenue Code.

This fact is not disputed. Were it the only tax factor, it would be the clear source of a substantive difference between the two approaches. But the existence of comprehensive interperiod income tax allocation suggests that: (1) the tax effects to the *investor* (owner) differ from those to the *investee* (issuer), and (2) the investor should provide deferred taxes on its share of the increase in the investee's stockholders' equity. While no financial accounting pronouncement deals with this specific topic, *SAB 51* did adopt the *Issues Paper* recommendation calling for deferred tax treatment. In discussing the matter, however, the *Issues Paper* also refers to *APB Opinions 23* and *24*. Specifically, it notes that *APBO 23* states that satisfaction of the "indefinite reversal criteria" removes the need to provide deferred income taxes on undistributed earnings of subsidiaries.

The *indefinite reversal criteria*, as that term is used in *APBO 23*, are based on the belief that the parent's *control* of the subsidiary can lead to: (1) permanent reinvestment of the subsidiary's earnings, or (2) remission of those earnings in a tax-free liquidation, neither of which would have tax consequences to the parent. This situation seems similar to subsidiary stock issuances: the funds generated belong to S, P's equity in S increases, there is no movement of funds between the affiliates, and P can dictate the ultimate use of the funds.

No substantive evaluation of how these two Opinions relate to subsidiary stock issuances was provided in the *Issues Paper*. Nor was reference made to FASB *Interpretation No. 22* [FASB, 1978, par. 10] which restricts use of the indefinite reversal criteria to the four specific areas addressed in *APBO 23*. Nevertheless, both the Accounting Standards Executive Committee and the Task Force concluded in the *Issues Paper* that the indefinite reversal criteria do not apply here and that deferred taxes should be provided on the gain or loss.

Consolidation Theories and the Accounting Issue

We believe that question (2) posed above—whether these are income or capital changes—can best be answered within the context of the two principal theories of consolidations. The *income*

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[1] In a subsequent section we examine how a sample of firms reported these transactions. Of those that disclosed the change in ownership percentage, the mean decrease was a nontrivial 18 percent, and ranged from a low of one percent to a high of 64 percent.

view considers these changes to result from the sale of an investment to outside interests and seems to follow from the *parent theory of consolidations*. Under the parent theory, consolidated statements are seen as an extension of parent company statements [AISG, 1973]. For example, neither asset revaluations nor goodwill are attributed to minority interests, which are reported as liabilities, and not as stockholders' equity, in a consolidated balance sheet. Moreover, only partial elimination (P's share) of a partially-owned subsidiary's unconfirmed intercompany profit is made in consolidation. While this issue of subsidiary stock issuances has not been discussed by parent theorists, we believe the parent theory would hold that:

- Since S cannot issue stock without consent of P, sale by P or issuance by S are seen to be equivalent in substance.
- Because both types of transactions involve dealings with minority shareholders *not* considered to be part of consolidated stockholders' equity, the resulting gain or loss belongs in P's income, not in its paid-in capital.

In contrast, the *capital view* sees the changes as affecting paid-in capital and seems consistent with the *entity theory of consolidations*. Under the entity theory, controlling and minority shareholders are treated equivalently as owners of the consolidated group [Moonitz, 1951]. For example, asset revaluations and goodwill are attributed to all shareholder interests and total elimination of S's unconfirmed intercompany profit is made proportionately against controlling and minority shareholders. We believe the entity theory would suggest that:

- The change in equity from S's stock issuance is due to capital transactions between the consolidated group and its shareholders, including the minority interest.
- The change in equity from P's sale of some of S's shares (rather than from a stock issuance by S) is tantamount to a sale of treasury stock, which traditionally is a capital transaction.

Current GAAP contain elements of both consolidation theories. While explicit adoption of one of the two theories can create a predisposition toward one of the two views of accounting for subsidiary stock issuances, care must be taken when inferring a specific position from a general statement of theory. For example, Moonitz (with whom the entity theory of consolidations is best identified) and Jordan [1964, pp. 237–242, 341–349] illustrate income statement treatment for gains arising from either P's sale of S's stock or S's issuance of stock. This supports the income view.

Conclusions

Taken together, the economic and theoretical considerations discussed above do not permit us to conclude unambiguously that: (1) sales and issuances of a subsidiary's stock are identical transactions; and, (2) they are both income *or* capital items. What is apparent is that the two alternatives lead to a reduction in P's ownership percentage. Why should the accounting be governed by the form in which this ownership reduction is accomplished?

As to substance, concerns over culmination of the *earnings process* do not seem relevant. Differences in total *entity size*, however, exist when P retains a given percentage interest in S. Moreover, the larger the reduction in P's percentage interest caused by the sale or issuance of the shares, the larger the difference in size. Thus, the increase in consolidated assets can be much greater when S issues the shares. The reported amount of consolidated net worth could also be dramatically different, depending upon which of the consolidation theories is used. While arguments can be made in support of both theories, and GAAP contain elements of both, the parent theory orientation seems to predominate [Beams, 1985, pp. 490-491; AISG, 1973, p. 27].

Whether provision of *income taxes* on gains from subsidiary stock issuances is required is not a settled matter. It seems to us, however, that a subsidiary stock issuance does produce an *unrealized gain* to the parent—to be reported in income or in capital—which will be recognized for tax purposes if and when the stock is sold. Thus, we reason that provision of income taxes on both alternatives is appropriate but the tax liability is currently payable when P sells the shares and deferred when S issues them. Indeed, the ability to achieve a desirable earnings impact without actual payment of taxes probably contributes to the popularity of subsidiary stock issuances.

We conclude that parent sales of subsidiary stock and subsidiary stock issuances are similar in substance but not identical. The fact that a *change in ownership percentage* occurs seems more important than the number of shares held by the controlling and minority interests, the entity selling the shares, or the amount of consolidated assets after the sale. Treatment of both as income items is consistent with the apparent predominance of the parent theory orientation in GAAP. If the entity theory orientation becomes predominant in GAAP, however, both should be treated as capital transactions. We now examine how these events have been reported in practice.

EXAMPLES FROM PRACTICE

A survey of corporate annual report data is used in this section to examine the magnitude of these gains, the related tax effects, and compliance with *SAB 51*'s reporting requirements.

Search Procedure

Searching through numerous financial databases,[2] we found 20 companies that reported a subsidiary stock issuance.[3] Seven companies reported such transactions in two separate years (usually consecutive) and two reported them in three consecutive years.[4] In all, 34 of these events were identified; 33 of them produced gains. Although *SAB 51* allows choice of income or capital treatment, only three of the gains were reflected in additional paid-in capital; the rest, including the one small loss, showed up on the income statement. This loss, reported by American Can in 1984, followed a gain reported in the same manner by American Can in 1983 on a previous stock issuance by the same subsidiary.

Analysis of Reported Gains

The gains attributable to the subsidiary stock issuances identified are presented in Table 1, along with income

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[2] The following databases were searched: Moody's Corporate News-U.S., Moody's Corporate Profiles, Standard & Poor's Daily News, Standard and Poor's Corporate Descriptions, Investext, PTS Annual Reports Abstract, F & S Indexes, Disclosure Financials, Prompt, Dun & Bradstreet-Dun's Market Identifiers, and Dun & Bradstreet-Million Dollar Directory.

[3] It is unlikely that all such companies were identified because database searches require the researcher to describe the event(s) sought. Many possible descriptions were used but we do not know whether they captured all events of the type sought.

[4] The databases were searched from 1982 to mid-1986. *SAB 51* became effective March 29, 1983 and was to be applied prospectively, except for previous subsidiary stock issuances made in periods covered by financial statements not issued as of 3/29/83. Therefore, these transactions could have appeared on financial statements covering five different years, 1982 to 1986.

TABLE 1
ANALYSIS OF GAINS ON SUBSIDIARY STOCK ISSUANCES

				Gain on Subsidiary Stock Issuances			
Company	*Year*	*Operating Income ($M)*	*Adjusted Net Income[1] ($M)*	*Reported On[2]*	*Amount[3] ($M)*	*Percent of Operating Income*	*Percent of Adjusted Net Income*
American Can Co.	1983	$248.8	$ 94.5	I/S	$10.4	4.2%	11.0%
	1984	305.3	136.6	I/S	(1.3)	(.4)[4]	(1.0)[4]
American Maize-Products Co.	1984	15.6	3.7	I/S	6.3	40.4	170.3
	1985	.1	(5.1)	I/S	.5	500.0[4]	(9.8)[4]
Beard Oil Co.	1985	26.1	1.4	I/S	12.7	48.7	907.1[4]
Chemed Corp.	1984	Not Shown	20.1	I/S	1.9	N/A	9.5
	1986[5]	Not Shown	8.7	I/S	2.5	N/A	28.7
Comnet Corp.	1983	(.2)	.4	I/S	.007[6]	(3.5)[4]	1.8
Dome Mines Ltd.	1984	64.9	.2	I/S	6.7	10.3	335.0
	1985	51.8	(32.4)	I/S	12.4	23.9	(38.3)[4]
	1986[5]	40.5	1.9	I/S	22.8	56.3	1,200.0[4]
Emerson Radio Corp.	1983	11.6[7]	(3.5)	I/S	6.6	56.9	(188.6)[4]
	1984	30.5[7]	4.9	I/S	5.4	17.7	110.2
	1984[8]	30.5[7]	4.9	I/S	.5	1.6	10.2
First RR & Banking Co. of GA	1983	Not Shown	25.9	B/S	4.2	N/A	16.2
ICN Pharmaceuticals, Inc.	1983	3.9	1.5	I/S	.7	17.9	46.7
	1984	4.0	.1	I/S	.8	20.0	800.0[4]
	1985	1.0	(18.6)	I/S	.4	40.0	(2.2)[4]
Insilco Corp.	1983	66.1	23.1	I/S	11.3	17.1	48.9
ITT Corp.	1983	833.9	664.7	I/S	9.8	1.2	1.5
	1984	660.3	393.3	I/S	54.7	8.3	13.9
Leucadia National Corp.	1983	Not Shown	19.4[9]	I/S	1.4	N/A	7.2
Maynard Oil Co.	1983	(4.7)	.1	I/S	1.5	(31.9)[4]	1,500.0[4]
National Patent Development Corp.	1983	Not Shown	6.1	I/S	7.5	N/A	123.0
	1986[5]	Not Shown	(2.1)	I/S	3.6	N/A	(171.4)[4]

TABLE 1—*Continued*

Company	*Year*	*Operating Income ($M)*	*Adjusted Net Income*[1] *($M)*	*Gain on Subsidiary Stock Issuances* *Reported On*[2]	*Amount*[3] *($M)*	*Percent of Operating Income*	*Percent of Adjusted Net Income*
Telcom Plus International, Inc.	1984	(8.3)	(5.3)	I/S	6.7	(80.7)[4]	(126.4)[4]
	1984[8]	(8.3)	(5.3)	I/S	19.0	(228.9)[4]	(358.5)[4]
	1985	(33.4)	(24.7)	I/S	26.9	(80.5)[4]	(108.9)[4]
Texas Air Corp.	1983	(135.9)	(202.1)	I/S	24.2	(17.8)[4]	(12.0)[4]
TIE Communications, Inc.	1983	44.1	48.1	B/S	25.0	56.7	52.0
TII Industries, Inc.	1984	2.5	2.1	I/S	1.2	48.0	57.1
Triton Energy Corp.	1984	Not Shown	6.7	I/S	3.4	N/A	50.7
	1984[8]	Not Shown	6.7	I/S	2.8	N/A	41.8
Xerox Corp.	1984	Not Shown	290.5	B/S	43.6	N/A	15.0
Summary statistics using all events[4]:							
Mean					$ 9.9	56.5%	193.4%
Standard deviation					12.7	103.4	360.5
High					54.7	500.0	1,500.0
Low					(1.3)	.4	1.0
Summary statistics excluding negative percentages and outliers[4]:							
Mean					$10.5	27.6	57.5%
Standard deviation					14.9	20.4	79.1
High					54.7	56.9	335.0
Low					.5	1.2	1.5

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[1] In order to determine an event's *pro-forma* impact on net income, the gain or loss, net of taxes, was removed from income when recorded there.

[2] I/S = Income Statement; B/S = Balance Sheet.

[3] Gain or loss prior to tax impact.

[4] Interpretation of the impact when either the numerator or denominator is negative is difficult. In addition, small denominators cause large percentages. To manage these problems, summary statistics are calculated twice: (1) with the absolute value of the results and including those with small denominators, and (2) excluding negative percentages and outliers (≥500.0). Eight (14) events were excluded from the operating income (adjusted net income) summary statistics calculations.

[5] Information is from interim financial statements.

[6] *SAB 51* requires inclusion of gains or losses, regardless of materiality.

[7] Company did not report Operating Income but it was calculable from the information given.

[8] Company had two separate events during this year.

[9] Tax treatment of the gain was undeterminable so that Adjusted Net Income = Net Income − gross amount of the gain.

data for the reporting companies which we used in judging materiality.

The summary statistics at the bottom of Table 1 show that gains reported on subsidiary stock issuances by the 20 companies ranged from $(1.3) million to $54.7 million with an average of $9.9 million. To assess the relative significance of these gains, we compared them with each company's: (1) reported *operating income* (or *income from continuing operations* if the firm reported discontinued operations, extraordinary items, or cumulative adjustments); and (2) *adjusted net income*—reported *net* income (loss) reduced by the gain (net of any tax effect).[5] Most of the gains were quite large with an average of 56.5 percent of operating income and 193.4 percent of adjusted net income. With negative percentages and outliers removed from the computations (see fn. 4 to Table 1), the average percentages dropped to 27.6 percent and 57.5 percent, respectively.

Because many of the companies treated these gains as nontaxable events, we could not always compare aftertax gains with income after taxes. Thus, the above comparisons reflect *pretax gains* and *aftertax incomes* for *all* companies. Financial reporting of the tax effects is examined in the next section.

Analysis of the Tax Effects

Information related to the financial reporting of the tax effects appears in Table 2, which includes raw data, *proforma* calculations, and percentage comparisons.

Despite the strong recommendation in the *Issues Paper* that deferred taxes should be provided on these gains, half of the companies treated them as *nontaxable*. For the others, tax rates used ranged from less than ten percent to 46 percent. In our view, the subsidiary stock issuance is tantamount to a sale by the parent and the proper deferred tax provision would be based at most on the alternative corporate capital gain rate of 28 percent in effect when the gains were recorded. Thus, we calculated a *proforma* tax effect at 28 percent for all the companies and compared it with: (1) the reported tax provision (net of any tax actually reported on the gain), and (2) adjusted net income as previously defined. These percentage comparisons are also large—averaging 135.9 percent and 78 percent, respectively. Removal of negative percentages and outliers from the calculations (see fn. 3 to Table 2) lowered the average percentages to 60.6 percent and 61.8 percent, respectively.

Compliance with the Reporting Requirements of SAB 51

As long as issuance of shares by a subsidiary is not part of a broader corporate reorganization, either consummated or planned by the parent, *SAB 51* [SEC, 1983] indicates that any gain or loss from the transaction may be reported on the income statement. Unless a company publicizes a plan to reorganize, though, it is difficult to ascertain whether a subsidiary stock issuance is part of such a plan. We found no evidence in the Annual Reports or in *The Wall Street Journal* that the companies we identified were planning to or did reorganize.

According to *SAB 51*, the gain or loss must be presented as a *separate* line item, without regard to materiality, and be *clearly* designated as *nonoperating*. Moreover, the notes to the financial statements should contain an appropriate description of the transaction. Data re-

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[5] This amount was calculated directly from the consolidated income statement. Due to other differences between operating income and net income—such as extraordinary items—our "adjusted net income" cannot be calculated from the data in Table 1 alone.

TABLE 2

ANALYSIS OF TAX EFFECTS

				Pro-Forma Tax Effect			Actual Tax Treatment	
Company	*Year*	*Adjusted Net Income*[1]	*Gain ($M)*[1]	*Tax ($M) at 28%*	*Percent of Tax Provision*[2]	*Percent of Adjusted Net Income*	*Tax Provision*[3]	*Tax Rate Used*
American Can Co.	1983	$ 94.5	$10.4	$ 2.9	11.4%	3.1	Indeterminable	46%
	1984	136.6	(1.3)	(.4)	(1.3)[4]	(.3)[4]	Indeterminable	46%
American Maize-Products Co.	1984	3.7	6.3	1.8	60.6	48.6	Non-taxable	N/A
	1985	(5.1)	.5	.1	(1.3)[4]	(2.0)[4]	Non-taxable	N/A
Beard Oil Co.	1985	1.4	12.7	3.6	36.5	257.1	Deferred tax	46%
Chemed Corp.	1984	20.1	1.9	.5	3.5	2.5	Non-taxable	N/A
	1986[5]	8.7	2.5	.7	10.3	8.0	Not disclosed	28%
Comnet Corp.	1983	.4	.007	.002	1.0	.5	Non-taxable	N/A
Dome Mines Ltd.	1984	.2	6.7	1.9	4.3	950.0[4]	Non-taxable	N/A
	1985	(32.4)	12.4	3.5	8.8	(10.8)[4]	Non-taxable	N/A
	1986[5]	1.9	22.8	6.4	31.5	336.8	Non-taxable	N/A
Emerson Radio Corp.	1983	(3.5)	6.6	1.8	(97.6)[4]	(51.4)[4]	Non-taxable	N/A
	1984	4.9	5.4	1.5	17.5	30.6	Deferred tax	32%
	1984[6]	4.9	.5	.1	1.2	2.0	Non-taxable	N/A
First RR & Banking Co. of GA	1983	25.9	4.2	1.2	17.1	4.6	N/A-Put-in Capital	N/A
ICN Pharmaceuticals, Inc.	1983	1.5	.7	.2	21.8	13.3	Non-taxable	N/A
	1984	.1	.8	.2	22.7	200.0	Non-taxable	N/A
	1985	(18.6)	.4	.1	8.5	(.5)[4]	Non-taxable	N/A
Insilco Corp.	1983	23.1	11.3	3.2	12.2	13.9	Non-taxable	N/A
ITT Corp.	1983	664.7	9.8	2.7	1.6	.4	Non-taxable	N/A
	1984	393.3	54.7	15.3	681.5[4]	3.9	Non-taxable	N/A
Leucadia National Corp.	1983	19.4	1.4	.4	5.2[7]	2.1	Indeterminable	N/A
Maynard Oil Co.	1983	.1	1.5	.4	(14.1)[4]	400.0	Currently taxed	46%
National Patent Development Corp.	1983	6.1	7.5	2.1	47.1	34.4	Non-taxable	N/A
	1986[5]	(2.1)	3.6	1.0	(126.6)[4]	(47.6)[4]	Deferred tax	28%

TABLE 2—*Continued*

				Pro-Forma Tax Effect			*Actual Tax Treatment*	
Company	*Year*	*Adjusted Net Income*[1]	*Gain ($M)*[1]	*Tax ($M) at 28%*	*Percent of Tax Provision*[2]	*Percent of Adjusted Net Income*	*Tax Provision*[3]	*Tax Rate Used*
Telcom Plus International, Inc.	1984	(5.3)	6.7	1.9	322.9	(35.8)[4]	Deferred tax	26%
	1984[6]	(5.3)	19.0	5.3	900.6[4]	(100.0)[4]	Deferred tax	26%
	1985	(24.7)	26.9	7.5	1,223.5[4]	(30.4)[4]	Deferred tax	34%
Texas Air Corp.	1983	(202.1)	24.2	6.8	327.6	(3.4)[4]	Non-taxable	N/A
TIE Communications, Inc.	1983	48.1	25.0	7.0	29.7	14.6	N/A-Put-in Capital	N/A
TII Industries, Inc.	1984	2.1	1.2	.3	267.9	14.3	Deferred tax	28%
Triton Energy Corp.	1984	6.7	3.4	1.0	164.7	14.9	Deferred tax	9.9%
	1984[6]	6.7	2.8	.8	131.8	11.9	Deferred tax	9.9%
Xerox Corp.	1984	290.5	43.6	12.2	7.3	4.2	N/A-Put-in Capital	N/A
Summary statistics using all events[4]:								
Mean				$ 2.8	135.9%	78.0%		
Standard deviation				3.6	275.8	182.4		
High				15.3	1,223.5	950.0		
Low				(.4)	1.0	.3		
Summary statistics excluding negative percentages and outliers[4]:								
Mean				$ 2.3	60.6%	61.8%		
Standard deviation				3.0	98.8	116.3		
High				12.2	327.6	400.0		
Low				.002	1.0	.4		

[1] Per Table 1.

[2] Impact on tax provision *prior* to tax effect of subsidiary stock issuance.

[3] Treatment was determined by reference to footnotes describing the subsidiary stock issuance and the company's income tax accounting (particularly the analysis of deferred taxes and the reconciliation of the statutory and effective tax rates). If no information related to the tax treatment of the stock issuance was found, we labeled it "indeterminable."

[4] Interpretation of the impact when either the numerator or denominator is negative is difficult. In addition, small denominators cause large percentages. To manage these problems, summary statistics are calculated twice: (1) with the absolute value of the results and including those with small denominators, and (2) excluding negative percentages and outliers (≥500.0). Eight (11) events were excluded from the tax provision (adjusted net income) summary statistics calculations.

[5] Information is from interim financial statements.

[6] Company had two separate events during this year.

[7] Tax treatment was indeterminable so the reported tax provision was used.

TABLE 3

ANALYSIS OF COMPLIANCE WITH *SAB 51*'S REPORTING REQUIREMENTS

		Reporting of Gain or Loss		
Company	*Year*	*Designated as Nonoperating on Income Statement*	*Handled Properly on SCFP?*[1]	*Adequacy of Footnote Disclosure*[2]
American Can Co.	1983	Yes	No	Inadequate
	1984	Yes	No	Inadequate
American Maize-Products Co.	1984	Yes	Yes	Questionable
	1985	Yes	Yes	Adequate
Beard Oil Co.	1985	Yes	Yes	Inadequate
Chemed Corp.	1984	No-Included in Total Revenue	Yes	Questionable
	1986[3]		N/A[5]	Inadequate[6]
Comnet Corp.	1983	Yes	No	Inadequate
Dome Mines Ltd.	1984	Yes	No	Inadequate
	1985	Yes	No	Inadequate
	1986[3]	Yes	Yes	Questionable[6]
Emerson Radio Corp.	1983	No-Listed among Expenses, Other Gains and Losses	Yes	Questionable
	1984		Yes	Inadequate
	1984[4]		Yes	Inadequate
First RR & Banking Co. of GA	1983	N/A-Put-in Capital	Yes	Questionable
ICN Pharmaceuticals, Inc.	1983	Yes	Yes	Inadequate
	1984	Yes	Yes	Inadequate
	1985	Yes	Yes	Inadequate
Insilco Corp.	1983	Yes	Yes	Inadequate
ITT Corp.	1983	Yes	Yes	Inadequate
	1984	Yes	Yes	Inadequate
Leucadia National Corp.	1983	Yes	Yes	Inadequate
Maynard Oil Co.	1983	Yes	Yes	Questionable
National Patent Development Corp.	1983	Yes	Yes	Questionable
	1986[3]	Yes	Yes	Questionable
Telcom Plus International, Inc.	1984	Yes	No	Questionable
	1984[4]	Yes	No	Questionable
	1985	Yes	No	Questionable
Texas Air Corp.	1983	Yes	No	Inadequate
TIE Communications, Inc.	1983	N/A-Put-in Capital	Yes	Inadequate
TII Industries, Inc.	1984	Yes	Yes	Questionable
Triton Energy Corp.	1984	Yes	Yes	Inadequate
	1984[4]	Yes	Yes	Inadequate
Xerox Corp.	1984	N/A-Put-in Capital	Yes	Questionable
Totals:		Properly designated: 26 Improperly designated: 5 N/A: 3	Properly handled: 21 Improperly handled: 12 N/A: 1	Adequate: 1 Questionable: 13 Inadequate: 20

TABLE 3—*Continued*

[1] As *SAB 51* requires that these types of gains or losses are to be clearly designated as non-operating, their effect should be removed from Net Income to arrive at Working Capital Provided by Operations on the Statement of Changes in Financial Position (SCFP). If the issuing company qualifies as a subsidiary, the total proceeds should then be shown as an Other Source. If the gain or loss was recorded in Capital, the total proceeds should also be listed as an Other Source.

[2] Footnote disclosure is evaluated with the recommendations in Beresford [1984]:

1. number of shares issued
2. offering price per share
3. total proceeds realized from the stock issuance
4. carrying amount of the portion of the parent's investment that is deemed sold
5. amount of income taxes recorded
6. parent's percentage interest in the subsidiary before and after the stock issuance.

Disclosure was deemed *adequate* if five or six items were described, *questionable* if three or four items were described, *inadequate* if one or two items were described.

[3] Information from interim financial statements.

[4] Company had two events during this year.

[5] Statement of Changes in Financial Position not provided in the interm report.

[6] There were no footnotes to the interim statements. Management's comments on the statements did mention the event and those comments were evaluated against the recommended disclosures.

lating to these disclosure requirements appear in Table 3.

Reporting the Gain. As mentioned earlier, 31 of the 34 events were reported on the income statement. While most were material, several firms—American Can, American Maize Products, Comnet, and ITT—reported gains or losses that were not material as separate line items. Although we cannot be certain, it seems that firms *are* disclosing these events, even if not material.

Most of the firms either: (1) reported the gain or loss below the operating income or loss line, or (2) clearly designated the amount as nonoperating by presenting it in a separate area below normal recurring revenues and expenses. Emerson Radio, however, listed all of its expenses below net sales, and included the gains arising from subsidiary stock issuances among them as credits, so that it was not clear that these were nonoperating. Chemed also did not clearly identify its gains as nonoperating as it reported them in total revenue.

Disclosure in the Statement of Changes in Financial Position. *SAB 51* does not address how these items should be reported in the statement of changes in financial position (SCFP). Because many firms use one concept of *operations* in their income statements and another in their SCFPs (e.g., see Nurnberg [1983] and Drtina and Largay [1985]), we determined how our sample companies treated these gains from subsidiary stock issuances. Shown in Table 3, this examination yielded numerous instances of companies reporting nonoperating gains on the income statement and then failing to remove them from net income in computing funds from operations on the SCFP.

Footnote Disclosure. What constitutes an "appropriate" level of footnote disclosure for these transactions is not spelled out in *SAB 51.* We used the guidelines provided by Beresford [1984] to evaluate the appropriateness of these footnote disclosures. He suggested that the description include: (1) the number of shares issued; (2) offering price per share; (3) total proceeds realized from the stock issuance; (4) carrying amount of the portion of the parent's investment that is deemed sold; (5) amount of income taxes recorded; and (6) the parent's percentage interest in the subsidiary before and after the stock issuance. As indicated in Table 3, every company provided a description of the transaction but only one of the 34 footnote disclosures was judged to be adequate in terms of Beresford's criteria.

CONCLUSIONS AND RECOMMENDATIONS

Analysis of the sample companies makes it obvious that most gains from subsidiary stock issuances cause material increases in the parent's equity and are included in periodic income. Half of these gains were treated as permanent differences and deferred taxes were not provided. As a result, these firms reported bottom line results *much* higher than if the gains had been added to paid-in capital. Firms may be taking advantage of *SAB 51* to window-dress the income statement without recognition of the related deferred income taxes.

Edmund Coulson, Deputy Chief Accountant of the SEC, was quoted by Berton [1984, p. 12] in *The Wall Street Journal* article cited earlier as saying, "we're constantly monitoring applications of our rules when they raise unusual questions." We believe this is an area that *does* raise unusual questions which are not easily resolved by reference to accounting theory. We have concluded that, while the economic differences between the two alternative ways of reducing the parent's percentage interest may not be substantial, they are not zero. Ultimate resolution of the accounting issue, in our opinion, depends on determination of whether the event is an income or capital transaction—which in turn may be linked to a consolidation theory—and to the propriety of providing taxes on the gains. What is clear is that many of the stock issuances by subsidiaries *are* material and that the related financial reporting *is* inconsistent.

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BOOK REVIEWS

Richard P. Brief, Editor

Editor's Note: Books for review should be sent to Professor Richard P. Brief, 520 Tisch Hall, 40 W. 4th St., Schools of Business, New York University, New York, NY 10003.

PHILIP W. BELL, *Current Cost/Constant Dollar Accounting and Its Uses in the Managerial Decision-Making Process*, McQueen Accounting Monograph Series Volume No. 3 (Fayetteville, AR: University of Arkansas, 1986, pp. xvi, 73, $7.00 paper).

On September 19, 1981 in Central Park as they sang "After changes upon changes we are more or less the same," it was as if 20 years never happened. In this short monograph, Philip Bell gives the same nostalgic pleasure of clear harmonies and simple certainties of a Simon and Garfunkel revival. After a page of introduction and a page of conclusion, the work is set out in two main sections: "Current Cost/Constant Dollar Accounting [CC/CD]: What it is and what it is not" (17 pages); "Current Cost/Constant Dollar Information and Managerial Decisions" (50 pages).

The two sections stand pretty independently. The first section is a mixture of advocacy and succinct exposition of the classic Edwards and Bell (1961) *The Theory and Measurement of Business Income* framework. The main components of comprehensive current real income; current cost depreciation; current operating income; realized and realizable real cost savings (unrealized holding gains) are only very briefly set out and readers would need to be already familiar with the ideas of the original, since the writing is biased more towards answering critics (frequent misunderstandings) than straight exposition. After 25 years, the style is more or less the same: normative, *a priorist*, full of neologisms, proceeding by simple numerical examples, replete with assertions, some of which may be value judgments, others may be empirical, others again may be logical assertions. Part of the fun for the reader of any normative work is disentangling this skein. There is only one reference to any empirical work (Lindenberg and Ross on Tobin's *q* ratio), and at times the essay displays the characteristics of pure metaphysic, e.g.,

> "A cost saving should be recognised as an event of the period in which it occurs" (p. 11) or "(T)he Current Real Income concept . . . (w)hile it is a useful, and indeed I think an essential concept for decision making, it is decision neutral, i.e., it is not tied to any particular business decision" (p. 16).

A style of writing which has disappeared from academic journals (indeed over half the citations are to books and monographs where SOATATA's classical approach to theory development lives on), this first essay would make an excellent provocative short paper to set for a graduate seminar on an income theory course.

The second part of the monograph is about the benefits of CC/CD analyses for managerial decisions about: (i) evaluating investment activities and the abandonment decision (26 pages); (ii) comparable performance measures (11 pages); (iii) short-run price-output decisions (3 pages); and (iv) the bond refunding decision (4 pages). Here I am unpersuaded of the value of this style of writing. There is a vast literature on these issues in financial management, and not to cite a single one is taking normative and *a priorist* assertiveness too far.

Considering each of the decisions in turn, as far as capital budgeting is concerned, Bell proposes a planning framework of Excess Current Real Income (this would be simply residual income (RI) in the management accounting literature). There are two major benefits of a CC/CD reporting system over the alternatives: (i) to be "tipped off" about possible changes in the final dividend expected at the end of the plan period;

and (ii) to indicate when it becomes profitable to liquidate the assets before the end of the plan period. Now setting up a standing system which needs as input the current costs of sunk investments, both current costs of assets as they age and current costs of equivalent new assets is an expensive undertaking. Costly data only become valuable information if relevant to some decision. Data without context are noise. Why should data about possible windfalls at the end of a project be information?

As for the second benefit, the abandonment decision, one needs *NRV* information. CC/CD is irrelevant. The essay tries to cloud this issue by discussing deprival value thinking in which comparisons in some decision contexts (but not abandonment) use current (replacement) costs. This part of the essay reminds me of an old unhappiness, not just with the style, but also with the methodological weakness of income theory in having no account of secondhand markets for real capital assets. For example, when considering the case in which a manager thought that $CC>PV>NRV$ the essay repeats the conventional wisdom that: "These conditions suggest that we continue to use our assets, but that they not be replaced as they wear out. Nor should any further expansion along these lines be contemplated . . ." (p. 37). Now if a manager had a theory of the dynamics of markets in real capital assets which linked their current costs to demand by his competitors, and increases in this demand for productive assets to profit expectations in which $PV>CC$, then the manager might be advised to do different things than if current costs had risen merely because the supply from capital equipment manufacturers had fallen.

The second benefit of CC/CD information is to provide comparable performance measures. Provided acceptably credible (to the principal actors) current values are available then a current value system removes a distortion caused by historical cost accounting when comparing divisions with assets of differing age structure. The third application discussed is to standard short-run micro-economic CVP. The essay is too brief at this point, and this presents a real puzzle to the reader. Short-run means a time span in which productive capacity cannot be altered, hence fixed capital is constant and does not vary with output. Bell asserts (p. 60) that: "Price and output for a single period are maximised (sic) when marginal revenue . . . equals marginal cost ["Cost" including outlays for inputs other than plant and equipment (C) plus current cost depreciation (*CCD*) plus interest at the "target rate" on the current value of capital invested (iN_{t-1})]."

The puzzle is why the last two terms are included, since by definition of the short-run $d(CCD)/dQ=0$, and $d(iN_{t-1})/dQ=0$. It is difficult to follow Bell in his assertion that CC/CD information is relevant to short-run pricing decisions.

The final section is even briefer and is entitled "creditor equities in the CC/CD framework." It points out that one also needs market values in the bond refunding decision, the rest of the discussion is about conflicting treatments in comparative international accounting standards.

Overall, this little monograph is a provocative piece of writing in its overstated claims: "We have tried to show in this monograph how and why keeping track of current values, on assets *and* on liabilities, is absolutely essential for managers who must make decisions" (p. 69). Although this reviewer is not persuaded by the arguments, I can recommend this little book as a rich source to use on graduate courses.

ANTHONY STEELE
Ernst & Whinney Professor
of Accounting
University of Warwick, UK

J. E. BORITZ, B. G. GABER, and W. M. LEMON, *An Experimental Study of Review of Preliminary Audit Strategy by External Auditors* (Toronto: The Canadian Academic Accounting Association, 1987, pp. x, 149, Can. $25.00 paper).

This monograph examines auditor judgment in the assessment of audit risk and in planning the preliminary audit strategy. Audit planning has become increasingly important as auditors search for ways to improve audit efficiency. However, little empirical evidence is available on this component of the audit process. This timely study makes an important contribution to our understanding of audit risk assessment in audit planning. In addition, the monograph includes a useful review of the audit judgment literature that relates to audit strategy formulation.

The empirical study incorporates a comprehensive array of audit planning considerations. Eighty auditors (two juniors, two seniors, two managers, and two partners from each of ten accounting firms) reviewed a hypothetical auditor's tentative audit strategy. This strategy consisted of the following ten specific judgments:

1. Maximum overall audit risk acceptable to the profession in these circumstances,

2. Overall audit risk acceptable to you for this audit,
3. Inherent risk associated with this audit,
4. Control risk that internal control failed to prevent or detect material errors,
5. Degree of assurance to be obtained from analytical review procedures,
6. Materiality (in dollars),
7. Planned reliance on internal controls,
8. Precision (in dollars) to be used in planning inventory audit tests,
9. Degree of assurance required from substantive tests, and
10. Degree of confidence you have in the above audit strategy assuming no material errors are found by your audit procedures.

The subjects evaluated the hypothetical auditor's strategic judgments, provided a revised set of judgments, and noted their difficulty in making these judgments. In addition to examining differences between firms and positions, the authors also manipulated five dichotomous client variables (prior years' errors, financial position, inventory condition, internal control, and engagement type), the audit strategy proposed by the hypothetical senior (also at two levels), and subjects' response mode (silent vs. think-aloud).

The authors state that their two main objectives are (1) to provide descriptive data about audit strategy formulation, and (2) to experimentally test hypotheses about subjects' behavior. However, the experimental setting limits the extent to which subjects' responses can be said to describe current practice. For example, the authors recognize that subjects' risk assessments are influenced by the values provided by the hypothetical auditor (i.e., the authors). Furthermore, except for the dollar materiality and precision judgments, all of the judgments required a percentage assessment. However, the majority of subjects were unfamiliar with the quantitative nature of the judgments required. For the overall audit risk acceptable for this audit (judgment #2), 57 percent of subjects indicated that they have never made such a quantitative assessment, 19 percent responded they seldom do, while 25 percent responded that they routinely make such a quantitative judgment. These (and the more detailed results reported in the monograph) are of interest in themselves, but suggest that the subsequent results (especially the particular reported values) need to be considered with caution.

Results are presented on each of the ten judgments, and the authors discuss the firm and position effects and the effects of the manipulated variables when significant. They find some evidence of firm and position effects; furthermore, subjects generally anchored on the hypothetical auditor's tentative audit strategy. Specific findings include the important role played by the internal control variable. However, not only did a weak internal control system appear to increase inherent and control risks and the degree of assurance to be provided by substantive tests, it also influenced overall audit risk and materiality. Some subjects' materiality judgments were also influenced by the client's financial condition, suggesting the use of materiality as a substitute for adjusting overall audit risk. Finally, the pattern of subjects' risk judgments did not appear to conform to the available authoritative audit risk models.

The study's primary conclusion is that considerable work remains for both the profession and researchers in clarifying and communicating the nature of audit risk and its role in audit planning. This monograph is recommended reading for those interested in taking up the challenge.

E. Michael Bamber
Assistant Professor of Accounting
University of Florida

J. R. Edwards, Editor, *Legal Regulation of British Company Accounts: 1836–1900*, two volumes (New York and London: Garland Publishing, Inc., 1986, Vol. I: pp. xviii, 335; Vol. II: pp. 402; $80.00).

Quoting from the first paragraph of the Introduction, the purpose of this work is "to provide readers with the essence of the many debates that took place, the conclusions reached, and the action taken to regulate company accounts" in Britain between 1836 and 1900. This "essence" is more than 700 pages of extracts and whole texts which were photocopied from original legal documents. The book is briefly summarized in the Introduction with an Outline of Events in six major industries. This outline follows a short sketch of the historical context in which the legislative events took place and an overview of that legislative process.

Except for the Introduction, the entire work consists of reproduced materials relating to accounting for business operations in the private sector from 1836 to 1900. The main topics are the form and the content of accounting reports to stockholders, to creditors, to the Registrar of Joint Stock Companies, to the Secretary of State, and the Board of Trade. The book does not include materials on the legislative process relating to prospectuses, provisions for winding up, statistical reports, accounting for not-for-profit societies, and accounting for governmental units. "The aim of the book is to focus attention on the steps leading to new legal regulations" of accounting for private business. The reproduced items provide evidence of strongly-held opposing views about regulation during this period.

Volume I deals with "statutory" companies, those which received by special act of Parliament specific powers for compulsory purchase (i.e., eminent domain). Volume II deals with "registered" companies, those which received no special grants of power from Parliament, but which through general legislation enjoyed limited liability. Volume I treats four specific industries (railways, gas, electricity, and water) in addition to general provisions for all statutory companies. Volume II treats two specific industries (banks and insurance) in addition to general provisions for all registered companies. As the editor notes, the documents do not always fall neatly into this classification scheme, and overlap does occur. But no cross-references are given in the lists of contents for each section. The editor says the contents of the book was affected by "some fairly arbitrary decisions about what regulatory aspects should be included/excluded." However, he does not discuss explicitly the criteria used in making those decisions.

By my count, the reproduced documents consist of 32 Acts of Parliament, 38 Bills presented to Parliament for debate (many of which did not result in legislation), 16 Committee Reports and Minutes of Evidence, and 41 examples of published accounts (13 of which are presented on 53 unnumbered pages at the end of Volume II). Acts of Parliament comprise 19 percent of Volume I and six percent of Volume II. Bills comprise 27 percent of Volume I and 19 percent of Volume II. Committee reports, evidence, and accounts comprise 50 percent of Volume I and 65 percent of Volume II. Overall, the reproductions fill about 90 pages of Acts; about 170 pages of Bills; about 425 pages of reports and minutes, and more than 53 pages of account examples.

This unusual collection of original source materials will greatly aid research scholars who are interested in the history of accounting law in 19th century Britain. This book on legislation seems to be a worthwhile companion to the collection of judicial decisions from roughly the same period, namely *Law and Accounting: Pre-1889 British Legal Cases* (New York and London: Garland Publishing, Inc., 1986), edited by Jean Margo Reid.

Consulting this companion work, I discovered a typographical error in the Introduction. In two separate places, Edwards dates the collapse and investigation of the City of Glasgow Bank as 1868. However, Reid's reproduction (page 112) of the decision in the City of Glasgow Bank *v.* Mackinnon (9 Court Session, 4th series, 535 [1881] Scotland) indicates the collapse was ten years later. Such an error is a source of irritation, as is the absence of page numbers in both the Introduction and the Examples of Accounts. But these minor editorial matters can be overlooked in the larger view of easy access to significant documents—some of which are reproduced in their original Old English font.

Not so easily overlooked is the fact that most of the reproductions result in 7-point type (or smaller) which is too tiny for normal unstrained reading. Furthermore, the printing is sometimes too faint for unstrained recognition of words and figures. But these physical inconveniences may be excused by serious scholars who keep the whole project in perspective. Without this work, these documents simply would not be inexpensively accessible.

Here is a lengthy, important, novel story about 65 years of accounting legislation in Britain, complete with diverse characters and complex inherent plot. What we now need is for historians to raise questions about this *real story* for which an *ideal model* of political behavior might provide answers to explain, "How could this have happened?" Conversely, we also need abstract theory—a conceptual model complete with independent variables and causal relations—to provide questions for which these factual documents might give answers in a test of predictive validity.

The antiphonal gestalt of real story and ideal metaphor constitutes a profound research program for accounting law. For this future program, the present offers both bad news and good news. The bad news is that mainstream research in accounting currently emphasizes the construction of *a priori* mathematical models and hypothetical-deductive, nonphilosophical "positive" research. Mainstream accounting research offers no encouragement for hermeneutic historians. The good news is that this valuable source book of legal documents from a critical period is printed on "acid-free 250-year-life paper"—a noble forethought by the publisher and a claim not matched by accounting journals.

Hopefully, the study of accounting law won't have to wait quite that long for a fruitful marriage between real and ideal, history and prediction, evidence and theory, story and metaphor. This book at least implies a courtship proposal.

Orace Johnson
Professor of Accountancy
University of Illinois at Urbana-Champaign

Kenneth R. Ferris and **J. Leslie Livingstone**, Editors, *Management Planning and Control*, Revised Edition (Columbus, OH: Century Publishing Co., 1987, pp. xvii, 249, $15.95 paper).

The revised edition includes readings from behavioral scientists and accountants and the thrust of the book is one of developing the relationships among five broad behavioral topic areas and their managerial accounting applications with a contingency theory flavor. The approach used by the editors is one of presenting each topic from the behavioral scientist's view and that same topic presented from the management accountant's perspective. This book is an important contribution to the accounting behavioral literature and is particularly relevant for use in master's or doctoral level managerial accounting coursework.

The five topic areas include organization strategy and resource allocation (Part II),[1] divisional planning and control (Part III), measurement of business unit performance (Part IV), budgets, motivation, and control (Part V), and managerial decision making (Part VI). Part II of the book presents basic strategic and budgeting approaches for the business entity. Conceptual issues and strategic planning are emphasized rather than application issues. While informative for the development of the background issues, it is the least exciting section because it sometimes sidetracks to peripheral issues which are related to the topic but not paramount to the focus of the book. For example, in chapter 3, the excellent discussion of structure and budgeting is less effective as the authors discuss strategies for transfer pricing and relevant costs. While these subjects are important and relevant with respect to application of cost allocation strategies, the discussions seem to disrupt the continuity of the chapter with respect to the central theme of that section—that of developing the strategic accounting approach for general resource allocation.

The divisional planning and control section of the book presents an organizational structure approach using the effects of both internal and external factors in the performance evaluation process using contingency theory in the accounting information system. These two chapters include excellent discussions of divisional and accounting decision making using the contingency theory approach.

Part IV includes discussions of business unit performance (chapter 6) and accounting unit performance (chapter 7). Chapter 6 discusses the overview of organizational effectiveness, contemporary models of effectiveness, and the paradox which exists when examining business effectiveness. As the authors undoubtedly intended, after reading this chapter one should have more questions and uncertainties concerning the corporate measure of effectiveness than before reading the chapter. Chapter 7 allows the reader to put in perspective some of the uncertainties which were introduced in the previous chapter. Again, the perspective is mainly conceptual in nature, which is consistent with the theme of the book.

Part V on budgets, motivation, and control is an excellent presentation of the "point/counterpoint" argument. While asserting that the budget function is a vital tool for organizational success, Umapathy (chapter 8) asserts that budgeting studies have done little to aid practitioners in the budget function. Conversely, Brownell (chapter 9) describes the evidence which supports the notion that there exists variables which are related in the budget function; however, that interrelationship with respect to actual decision processes may not be known at present. From a purely behavioral approach to budgeting, these two chapters may be the single best literature review of current thought on the subject.

The last section of the book, Part VI, discusses individual judgment and managerial decision making under uncertainty. These two chapters are consistent with the thrust of the book. They emphasize the role of people in the decision process, even in an environment of uncertainty.

This book is a must for those interested in managerial accounting issues with a pure behavioral approach!

Don W. Finn
Associate Professor of Accounting
Texas Tech University

John W. Kendrick, *Improving Company Productivity: Handbook with Case Studies*, in collaboration with the American Productivity Center (Baltimore, MD: The Johns Hopkins University Press, Paperback Edition 1986, pp. xii, 220, $10.95 paper, $24.50 cloth).

This handbook by the "guru" of productivity measurement is essential reading for researchers in management accounting and performance evaluation. It includes updated materials from the 1960's classic on measuring company productivity by John Kendrick and the late David

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[1] The introduction to the book is included as Part I.

Creamer. The present edition makes these topical materials more broadly accessible.

The major objective of this three-part volume is "to provide an authoritative guide for measurement of productivity in the company and its organizational components . . ." (Chapter 1). Fundamental issues in productivity measurement are discussed in Part I. Kendrick defines productivity, with reference to a production function, as the efficiency with which resource inputs are used to produce a given quantity of goods and services (Chapter 2).

Part I contains several of Kendrick's prescriptions about how inputs, outputs, and productivity may be measured. Outputs are measured by "total current production, not just the physical volume of shipments." This, of course, implies that the data needed for a productivity measurement system differ from the data generated by the usual accounting systems which focus on shipments and sales because of their income statement orientation. A problem in measuring goods and services is that characteristics and quality change over time. Kendrick suggests the use of relative (net realizable) market prices as indicative of relative qualities of products (Chapter 4). Inputs are aggregated under four categories: labor, materials/services, capital, and indirect business taxes (Chapter 3). Labor hours should be measured as those worked rather than those paid for. They should be weighted by occupation (relative wage rate). Capital inputs should be measured by applying the appropriate rate of return (including depreciation) to the real gross value of tangible and financial assets devoted to production (Chapter 5).

Kendrick explains that productivity measurement is important because "programs to improve productivity can be more effective if they are linked to measures that help to identify problem areas and that can be used to track the progress resulting from . . . productivity improvement programs." He emphasizes that awareness and measurement of productivity strengthens the motivation of managers to improve productivity.

Part II (Chapters 6-9) explains how productivity measures can be used in comparative profitability analysis. Chapter 7 provides a detailed explanation of the computational aspects of the most common of such productivity-based performance measurement systems. This system, made popular by the American Productivity Council (APC), links two time periods, or actual results with budgets. Its objective is to explain profitability changes in terms of productivity and price recovery changes. Other chapters in Part II, prepared with the assistance of APC staff, describe the use of the APC performance measurement system for interplant, interfirm, and industry comparisons.

This handbook, however, does not discuss the shortcomings of the APC system. All resource inputs, whether fixed or variable, are treated the same in this system, and the partial productivity ratio for each input is determined by comparing simply the proportionate change in the input with the proportionate change in the aggregate output. Thus, these productivity ratios confound "true" productivity changes with changes in the activity level. Another problem stems from the manner in which multiple outputs are aggregated by using output prices as weights. The relative input requirements of the outputs may be quite different from their relative prices, and may well vary for different inputs. Differences in input requirement intensities are emphasized in a standard cost accounting system, but in ignoring such differences the APC productivity measures confound "true" productivity changes with simply changes in the output mix.

The focus of Part III (Chapters 10 and 11) is on promoting company productivity. The two chapters in this part and the seven case studies in Appendixes A and B, discuss lessons learned from the implementation of productivity measurement and improvement programs. Some other published case studies are included in the bibliography.

Kendrick's advice is to keep it simple. "It must be remembered the productivity measurement is not the primary target; merely measuring productivity is not going to improve it. But measurement is essential. . . ." Kendrick lists five principal benefits of productivity measurement:

1. It helps to heighten awareness.
2. It provides the basis for tracking trends and rates of improvement.
3. It serves as a planning tool.
4. It permits interfirm comparisons.
5. "Financial ratios can often obscure the truth behind an organization's performance. An organization may be achieving targeted profit margins in the short run and yet have declining productivity. Unless this is spotted through productivity measurement, the organization may never arrive at the real solution, which is to focus on productivity, sacrifice margins in the short run, and survive in the long run."

In summary, this handbook provides an excellent description of the state of the art in company productivity improvement and measurement programs. While the particular productivity measurement system described here has some conceptual deficiencies, the breadth of productivity measurement issues discussed by John Kendrick provides a rich source for developing fruitful research strategies.

RAJIV D. BANKER
Professor of Accounting
and Management
Carnegie Mellon University

MARTIN MELLMAN, STEVEN B. LILIEN, and JAMES M. DOCHERTY, *Discovery Techniques: Obtaining and Analyzing Business Financial Data* (Boston and New York: Warren, Gorham, & Lamont, 1987, $85.00).

As the title suggests, this book has been written principally for attorneys. The authors state clearly in the preface that the purpose of the book is to provide an attorney with the ability to obtain relevant business financial data, to analyze the data, and to request modification or restatement of reports, if necessary. That is, the purpose of the book is to help the lawyer understand and analyze financial data, and make judgments about the value and credibility of the data.

These objectives constitute an enormous task for a single text. However, the authors have wisely constrained their objectives by observing that this book is not designed to allow attorneys to "dispense" with accountants! Instead, it should enable them to collaborate more effectively with the accountants and to determine what types of information may be needed for a specific situation.

The first chapter deals with the purposes and methods of corporate discovery—the procedures used for acquiring information from the various parties to litigation. The second and third chapters focus on corporate organizational structure, accounting systems and data, and the role of accounting information in the firm. The material includes discussion of such diverse topics as multinational structures, segment data, industries with specialized accounting practices, profit and cost centers, information problems arising from allocation of common costs, and internal management reports. Numerous charts, diagrams, and examples of actual data from well-known organizations enhance the presentation.

The core of the material for the analysis and interpretation of accounting data is found in Chapters 4-8 which cover external and internal accounting and reporting. After reviewing the rule-making environment of accounting, the particulars of the application of accounting principles are discussed. The focus, here, is on the variety of approaches to accounting measurement of economic events, the applicability of the measurements, and the uses, limitations, and interpretation of the generated data. These sections include numerous examples of actual financial disclosure. An example is Houston Oil and Minerals Corporation's treatment of the disclosure of a change in accounting method to bring its full cost accounting into conformance with regulatory pronouncements, and the effects of the change on the financial statements (p. 5-29). In addition, charts and tables of descriptive statistics (e.g., frequencies and percentages) are included which may prove helpful in assessing the relative importance of specific data items. An example of the latter is a table (p. 5-32) detailing the effect on income and retained earnings of adjustments made by 48 full cost method companies, including Houston Oil and Minerals.

An obvious potential problem with a general treatment of complex topics such as accounting for pension plans, push down accounting, and foreign currency translation, is the tendency to oversimplify. Consequently, the reader may enjoy a false security in his perception of the issues. In the same vein professional accountants might disagree with some of the particular discussions, feeling that important points have been omitted or that some of the material is not clear. For example, in the discussion of pension fund accounting, the distinctions between accumulated benefit and projected benefit obligations, or market and market-related asset values may not be entirely clear from the exposition, but these differences can have a significant impact on the financial statements. However, such problems are inevitable and the book keeps them to a minimum.

Overall, the book provides an accessible conceptual presentation, consistent with its objective of helping the attorney to deal with accounting information issues. Provided a modicum of caution is observed, this purpose can certainly be achieved by a careful reading of the text. I also think that the potential readership of this book extends beyond the legal profession. Financial analysts also should find it quite useful.

REBECCA TODD
Assistant Professor of Accounting
New York University

KENNETH S. MOST, Editor, *Advances in International Accounting* A Research Annual, Volume 1 (Greenwich, CT and London: JAI Press, Inc., 1987, pp. xiv, 404, $29.75 individuals, $59.50 institutions).

This book is a collection of 16 refereed articles edited by the vice-chairperson and chairperson-elect of the International Section of the American Accounting Association. The volume is similar in format to other JAI research annuals in their "Advances" series.

The nature of international accounting has generated research which is largely exploratory and often esoteric. This is due in part to the relative newness of the discipline. These factors often cause work in international accounting to appear not to have sufficient interest for the general readership of other accounting journals. In addition, there are few journals whose main concern is international accounting. Accordingly, there is a need for another forum in the field to accommodate the increased work in international accounting, and the JAI series can help to fulfill this need.

The editor's introduction identifies a wide audience for the book. Specifically mentioned are students and practitioners; however, some of the material is more appropriate for international accounting researchers.

The volume has four sections. Part I contains two articles on international accounting standards which are both descriptive and theoretical. Much of the material presented is not new, but the articles form a nice compendium for researchers in the area to obtain background information.

Part II contains articles on specific countries. Those on West Germany, Hungary, Brazil, and Belgium are largely historical and descriptive but they also provide insightful analyses. Two other articles, one on the history of French accounting thought and the other on information needs for Islamic banks, provide background information for those doing research in these areas. There is also an empirical study on Canadian attitudes toward external auditor independence. This is a well structured example of research methodology in attitude research in international accounting.

Part III contains articles classified as technical studies which are largely critiques and evaluations of current practice. Topics include forward exchange contracts, inflation accounting, regulation of international data communication, and foreign currency translation. There is also an empirical article on Soviet decision making which might be of interest to those in the area of technology transfer in operations management.

Part IV contains two articles on international accounting education. One study is an empirical investigation of Canadian attitudes toward continuing professional education, and the other is a proposed framework for improvement in international accounting education with third world countries of particular interest.

For the most part, papers in this volume, whether descriptive, empirical, or otherwise, are well done. My main difficulty with the book is that most of its contents are not truly "advances" in the field. While the editor achieves the stated goal of informing the student and practitioner of relevant and useful information, the contribution to research is primarily in the summary of background material for empirical work. There are only a few methodologically oriented articles and they are insufficient to make this book very helpful for doctoral students and researchers in carrying out empirical studies.

The title of the book suggests that it is devoted to reporting research results. My difficulty with the work is its lack of emphasis on what is widely recognized as research. I would like to see more empirical and theoretical articles in the second volume of this annual since the target audience is mainly an academic audience.

James A. Schweikart
Assistant Professor of Accounting
and International Business
Temple University

Accounting and Auditing in the People's Republic of China (Shanghai and Dallas: Shanghai University of Finance and Economics and The University of Texas at Dallas, 1987, pp. xiv, 226, $10.00 paper).

Studies in international accounting often begin with a discussion of the political, economic, and social peculiarities of the country under review. From this perspective it becomes easier to understand the country's current accounting and auditing practices as well as to gain some insights into the future direction of such matters as education and standard setting requirements. In their review of accounting and auditing practices in the People's Republic of China (PRC), five researchers from the University of Shanghai and Professor A. Enthoven (The University of Texas at Dallas) have taken this approach.

The book mainly focuses on the post 1978 era and therefore an historical and cultural perspective is particularly needed here to appreciate the business and accounting developments in China. Perhaps no other country has undergone more changes in the last 40 years than China. In its recent history, this land of a billion people has been occupied by several invaders besides going through a Marxist revolution in 1949. The economy was under Russian influence in the early fifties, then The Great Leap Forward, the Cultural Revolution and finally, with the return to prominence of Deng Xiaoping, a new economic order began in 1978.

In order to understand and appreciate the work that the authors have done, it is necessary to understand the forces at work in the changing China as a result of the reforms associated with Deng (whose name is surprisingly absent from the book). It is for this reason that any reader not familiar with the PRC might want to start with Part 2, the socioeconomic, political, and historical aspects of China. Armed with this background, the development of current accounting practices and the future needs of the country can better be grasped. In particular one could begin to comprehend the importance associated with the ending of the Cultural Revolution. This explains why most of the text focuses on the post 1978 era and the economic reforms that accompanied it.

The major part of the book, Part 1, deals with accounting, auditing, taxes, and education in the PRC. This section of the book, as well as the economy, can be loosely split into two major areas. The first is the state enterprise, which is the dominant force in the economy and represents most of the economic activity. The second area, and one that the current government is certainly nurturing, is the foreign joint venture that is designed to generate foreign currency and import foreign technology.

The goal of the state enterprise is to operate for the social good of all the people. This, in part, is achieved through a very rigid system of central planning, budgeting, and control. The authors describe the importance of fund accounting in the country and go into extensive detail on the practices the Chinese follow. The book further describes the central planning process and the need to transmit a uniform plan to all aspects of the economy. Accounting practices and the resulting auditing of the state enterprises are conducted to ensure that the state plans are carried out. With the new economic liberties that are now being permitted, the authors point out that there is a tremendous need to train more accountants and auditors to monitor the ever-expanding number and size of these operations. The education section gives us an indication of the magnitude of the training task that is ahead for the Chinese. The authors also provide sample course outlines listing the topics that they feel are relevant to the future needs of the economy.

In addition to the state run enterprises, the central government is now encouraging joint ventures. In order to meet the needs of these foreign operations, the government has had to modify accounting guidelines and train accountants for this area. The book points out that with only about 1,000 CPAs in the country, there is a need for growth in their numbers.

Expanding further on the nature of joint ventures, several chapters of the book go into detail about the regulations and taxes that joint ventures must deal with. These chapters would be of great value to any firm interested in entering such an arena especially since the reviewer has found little such data readily available to foreign firms.

The last part of the book, Part 3, consists primarily of Professor Enthoven's insights and explanations of how the Chinese operate. This is the most rewarding part of the text for the reader. As a recent lecturer in the PRC the reviewer finds that Enthoven provides a realistic interpretation of what the Chinese say about their current system and puts the entire situation into a perspective that can only be gained by repeated contact with the Chinese.

In closing, this book will be of interest to students in the field of international accounting. A reader who is unfamiliar with the Chinese situation should read Parts 2 and 3 first, then they will be able to enjoy this interesting book to its fullest.

JOSEPH WEINTROP
Assistant Professor of Accounting
State University of New York at Buffalo

ROSS M. SKINNER, *Accounting Standards in Evolution* (Toronto: Holt, Rinehart and Winston of Canada, Limited, 1987, pp. xvi, 712, Can. $44.95).

Don't be misled by the title: this book is not a history of accounting thought. Rather, the author provides a comprehensive survey of current standards and evaluates those standards against "basic historical cost accounting theory." The book could be used as a primary text in traditional accounting theory or contemporary problems courses, particularly ones that emphasize Canadian practice. Practitioners might also find the book useful as a reference tool for understanding the evolution of current practice.

The book is organized into four major sections. Following an introductory chapter, the first section (chapters 2 to 4) traces the historical development of accounting practice from its record-keeping origins to the contemporary emphasis on GAAP.

The second, and by far the longest, section surveys current Canadian and U.S. GAAP. Chapters 5 and 6 summarize the basic ideas of traditional transaction-based historical cost accounting theory and identify areas that are particularly weak links in that theory. Most of the remaining chapters in this second section (chapters 7 through 22) review existing standards for various types of "accountable events" that are commonly addressed in financial accounting courses—problems of asset and equity valuation and income determination. Skinner's approach includes: a general description of the problem and alternative accounting methods; theoretical arguments underlying those methods; a brif history of the authoritative literature in both Canada and the U.S.; inconsistencies in present practice; and recommendations and rationale for change.

Two chapters in the second section are particularly insightful. Chapter 16 is a comprehensive treatment of "passive" investments, including specialized industries, options and future contracts for hedging and investment purposes, and interest-rate swaps. This material could be tied in easily with the FASB's current project on financial instruments. The chapter on foreign currency transactions and translation is also noteworthy, especially the material on hedging.

Three specialized industries—oil and gas producing companies, financial institutions, and non-profit organizations—are also included in this second section. Skinner includes this material not for completeness but to demonstrate situations in which traditional historical cost accounting produces information of limited usefulness. He indicates techniques and supplemental disclosures that have been developed to improve financial reporting in those areas. The final chapter of section II evaluates the current state of accounting standards based on "general acceptance" and argues for developing theory to support the evolution of financial reporting.

The book's third section (chapters 27 to 30) deals with accounting for price changes and discusses alternate concepts of income, capital maintenance, and asset and liability measurement. Individual chapters are then devoted to three different models: general price-level, current cost (i.e., entry-value), and current realizable value (i.e., exit-value) accounting. Skinner describes each model in detail, identifies both implementation problems and conceptual issues, and suggests that a flexible combination of some features of each model might be best in practice.

In the book's fourth and final section, Skinner outlines his own "prescriptive" conceptual framework—a set of ideas useful in describing current practice and in analyzing the desirability of alternative standards. Those concepts are not meant to be novel; most are included in the FASB's framework. As Skinner points out, however:

> . . . it appears that attempts to state conceptual frameworks are unlikely to result in great flashes of illumination that instantly resolve areas of controversy in financial reporting. It is only if standard setters are prepared to take an explicit conceptual framework seriously and allow its influence to guide their resolution of individual issues that it will, little by little and from precedent to precedent, gain in power and utility (p. 649).

The book concludes with a discussion of accounting standard-setting. Skinner describes several possible systems: free-market voluntary standards developed from "general acceptance"; mandatory standards promulgated by a governmental agency; standards developed through the cooperation of private-sector and public-sector organizations (e.g., the U.S. experience); and authoritative standard-setting in the private sector (e.g., the current situation in Canada). Although the Canadian system has been largely successful, Skinner believes that the more complex business environment and the need for a more broad-based process may lead to more governmental involvement.

The usefulness of *Accounting Standards in Evolution* as a text may be limited by two omissions. First, Skinner does not include any assignment material other than chapter bibliographies. Discussion questions, short cases, and selected problems from professional examinations would make the book much easier to use as a primary text in an undergraduate course. Second, and perhaps more problematic, is the lack of detail about U.S. GAAP. Although the book is intended primarily for a Canadian audience, the omission of some important standards in the U.S. is unfortunate because the background material in the first section and the normative theory discussion in the final six chapters are appropriate for a wider readership.

One aspect of the book's organization is puzzling. The conceptual framework and discussion of standard-setting is presented in the last section of the book. That material should logically have been included prior to the book's main portion in which present standards are analyzed. That sequencing would have enabled the author to discuss the concepts' applicability to specific standards and to analyze how present practice is often inconsistent with those concepts.

Skinner has done an excellent job of producing a clear, comprehensive summary of current accounting standards. The development of a normative, workable foundation upon which standards should rest has proven elusive indeed. I hope that Skinner continues to work on the conceptual framework that he begins to develop in the final section of this book.

ALAN S. GLAZER
Associate Professor of Business Administration
Franklin and Marshall College

BASIL YAMEY, *Arte e contabilità* (Bologna: Credito Romagnolo, 1986, pp. 287, 133 ill.).

In this book the distinguished economist Basil Yamey, well-known to readers of this journal for his work in the history of accounting, has served up a feast of pleasures for anyone who shares his keen interest in both accounting and art. The book, in fact, is a wide-ranging exploration of all the possible relations between the two very different subjects.

As one might expect, the bulk of the book consists of a survey of works of art in which account books or accounting activity of some kind appear. These chapters are organized according to subjects such as portraits of businessmen, allegories, biblical scenes involving accounting and financial activity, etc., with most of the illustrative material dating from the fifteenth to the nineteenth centuries. There then follows a miscellany of essays on other relations: on accounting itself as an art form (the author denies this), on account books that physically represent high qualities of artisan production (especially the famous painted covers of the accounts of the Sienese government in the Renaissance), on drawings found in account books (incidental to any accounting function, obviously), and on account books of artists (mostly the earliest examples, from Renaissance Italy).

Perhaps the most interesting chapters for historians of accounting are the last two. In the penultimate Yamey considers the importance of accounting for economic growth and therefore for the greater wealth that makes art possible in the first place. Here Yamey deals with Sombart's well-known ideas about double-entry, coming down solidly on the side of those who hold that in fact the relation between this innovation in accountancy and economic progress is only incidental. He rejects not only the notion that double-entry gave rise to a capitalist mentality but also the idea that it engendered a kind of aesthetic sense that is somehow related to the Renaissance passion for mathematical order and symmetry in art. The final chapter is dedicated to Luca Pacioli, the writer of the first treatise on accounting. Consonant with the theme of his book, Yamey deals first with Pacioli's much-discussed relation to an artist, Piero della Francesca (who also wrote a treatise on mathematics) and then with a work of art depicting Pacioli, the famous portrait now in Naples.

It is difficult to come up with any subject to be dealt with in such a survey of the unlikely relation between these two subjects—art and accounting—that Yamey has not considered. He admits that there is no common theme running through his essays, and nothing appears in this book that will change our understanding of the history of accounting as we now know it. Nevertheless, anyone interested in the subject will obviously appreciate the repertoire of material—both pictorial and scholarly—Yamey has assembled. There is much delight to be had in poring over the many beautifully reproduced illustrations and in reading Yamey's urbane and informed discussions. He has mastered an enormous wide-ranging bibliography, what he has to say is always clear and concise and marked by good sense, and on occasion he offers original insights even to the works of art he has studied (for example, the Flemish portraits of money-changes and the Pacioli portrait). Moreover, the last two chapters will be of particular interest for the expertise Yamey brings to a discussion of two subjects of central importance in the history of accounting.

The reader should perhaps be cautioned that, unfortunately, he will probably not be able to obtain this book through his bookseller. It is privately published by a bank; and in an honored Italian tradition, banks produce such high-quality coffee-table books only as gifts to clients and stockholders, with no distribution to the general public through the marketplace. Nevertheless, banks will occasionally send complimentary copies to any scholar with legitimate interest in the subject who makes enquiries about the book's availability.

RICHARD A. GOLDTHWAITE
Professor of History
The Johns Hopkins University

Editor's Note: An English language edition of this book will be published by Yale University Press in Fall 1988.

NEW BOOKS: AN ANNOTATED LISTING

Editor's Note: As a general policy, books received but not reviewed in this or future issues will be annotated. There will be some exceptions.

JACK N. BEHRMAN, *Essays on Ethics in Business and the Professions* (Englewood Cliffs, NJ: Prentice Hall, 1988, pp. x, 358, $19.00 paper).

Collection of 18 essays discusses ethics as a set of rules to which those in business and the professions should adhere. Part I, "Ethics in the System" considers the origins of capitalism and the ways in which business in the United States today deviates from that system described by Adam Smith. The underlying thesis is that ethics is an inherent element in any economic system. Part II, "Ethics in Management and the Professions," evaluates the social responsibility of the individual as decision maker. The ethics which require the individual to exercise social responsibility are also applicable to the organization. Part III, "Ethical Issues in International Business," discusses ethical issues raised by the proliferation of the transnational corporation. Part IV, a Perspective, touches on issues raised in the preceding essays and considers the shape of leadership in the future. Each essay is followed by discussion questions and a list of suggested readings. Jack N. Behrman is a Professor of Business Ethics at the University of North Carolina, Chapel Hill.

ANDREW D. CHAMBERS, GEORGES M. SELIM, and GERALD VINTEN, *Internal Auditing*, Second Edition (London: Pitman Publishing, 1987, pp. viii, 439, £17.95).

The first edition of this volume, published in 1981, was reviewed in April 1983 issue of THE ACCOUNTING REVIEW. In light of growth in the field of internal auditing, the second edition takes a more applied than theoretical approach. Twenty-six chapters are divided into five parts which cover an overview of internal auditing, audit techniques, the management of internal auditing, computer audit, and the future of internal auditing. Among 17 appendices are statements on standards and ethics for the profession of internal auditing; examples of flow process charts; various considerations of risk analysis; a quality assurance checklist; and questionnaires for use in auditing MIS. Andrew D. Chambers is Dean and Professor of Internal Auditing; Georges M. Selim is Lecturer in Internal Auditing and Director of the Center for Internal Auditing; and Gerald Vinten is Lecturer in Internal Auditing at the City University Business School, London.

CANADIAN INSTITUTE OF CHARTERED ACCOUNTANTS, *Accounting and Financial Reporting by Venture Capital Organizations*, A Research Study (Toronto: The Canadian Institute of Chartered Accountants, 1987, pp. 75, Can. $27.50 paper).

Purpose of the study is to examine current accounting practices of venture capital firms in Canada and to evaluate ways in which these practices might be improved. The report's seven chapters evaluate the unique characteristics of a venture capital company and its investments; users of the financial statements of a venture capital firm and those qualities of accounting information which are important to this type of firm; valuation of the venture capital firm's assets; recognition of income from the investments of such a firm; and audit issues. Two appendices contain the results of a survey of venture capital organizations and financial statement disclosure for these organizations.

CANADIAN INSTITUTE OF CHARTERED ACCOUNTANTS, *Personal Financial Statements* (Toronto: The Canadian Institute of Chartered Accountants, 1987, pp. 74, Can. $22.50 paper).

Study addresses the problems of preparing personal financial statements in Canada in the absence of up to date accounting guidelines. Study group members, basing their conclusions on the accounting practices and auditing standards of the Canadian Institute of Chartered Accountants' Handbook, consider two main issues: (1) the accounting and reporting methods applied in the preparation of personal financial statements;

and (2) the compilation, review, and audit engagements concerning personal financial statements and the form of communication appropriate to each. Five appendices include a list of CICA Handbook sections relevent to personal financial statements; examples of personal financial statements; sample engagement letters; a list of typical enquiries for review engagements; and a sample client representation letter.

CHARTERED INSTITUTE OF PUBLIC FINANCE AND ACCOUNTANCY and THE INSTITUTE OF CHARTERED ACCOUNTANTS OF SCOTLAND, *Performance Measurement in the Public and Private Sectors*, Research Conference, December 1986 (London and Edinburgh: The Chartered Institute of Public Finance and Accountancy and The Institute of Chartered Accountants of Scotland, 1987, pp. xii, 87, £5.00 paper).

This joint publication contains papers which were presented at the first Research Conference of the Institute of Chartered Accountants of Scotland and the Chartered Institute of Public Finance and Accountancy in Edinburgh during December, 1986. The goals of the volume are to explain the objectives and mechanisms of accountability for performance measurement and to present case studies which illustrate performance measurement in operation. The nine papers and their authors are: Irvine Lapsey, "Financial Accountability and Performance Measurement in Local Authorities: Some Observations"; Peter Jackson, "Performance Measurement and Value for Money in the Public Sector: The Issues"; Andrew McCosh, "Performance Measurement in the Private Sector: The Issues"; Bruce Millan, "Performance Measurement: The Issues-The Political Dimension," Discussion Notes; Peter Brokenshire, "Performance Measurement: The Case of Local Government"; John Jackson, "Performance Measurement: The Case of a Manufacturing Company," Discussion Notes; Bill Sutherland, "Performance Measurement: The Case of the SSEB," Discussion Notes; Pat Burnet, "Performance Measurement: The Case of Long Term Investment Portfolios," Discussion Notes; and Hugh Morison, "Performance Measurement: The Case of the Health Service," Discussion Notes. The Foreword is written by Jack Shaw, Convener, ICAS Research Conference and David Chynoweth, Conference Chairman.

WILLIAM M. FOX, *Effective Group Problem Solving* (San Francisco and London: Jossey-Bass, Inc., 1987, pp. xvii, 204, $21.95).

Seventeen chapters describe the use of participative problem-solving in a work group and how such participation increases productivity, fosters innovation, and heightens employee involvement. The author presents the "improved nominal group technique," a framework of rules and procedures designed to mitigate or eliminate problems common to group work. The book also suggests ways in which this technique can be applied, for example, to enhance the effectiveness of video conferences or one-on-one relationships. An appendix contains a self-test with answers on the improved nominal group technique. William M. Fox is Professor of Management at the University of Florida.

PAUL A. GRIFFIN, *Usefulness to Investors and Creditors of Information Provided by Financial Reporting*, Research Report, Second Edition (Stamford, CT: Financial Accounting Standards Board, 1987, pp. xii, 294, $16.00 academics-paper).

Update of Griffin's 1982 study, reviewed in the April 1983 issue of THE ACCOUNTING REVIEW, which summarized and examined the findings of various empirical studies on the uses and effects of accounting information pertaining to the environment of accounting, properties of accounting numbers, behavioral and psychological aspects, economic effects on investors and creditors, and the impact on managers as users. Two major changes in this edition are the addition of a separate chapter on the economic effects of external reporting on managers and the input of new contributors who include: Lawrence D. Brown, State University of New York at Buffalo; Chee W. Chow, San Diego State University; Michael Gibbins, University of Alberta; James D. Newton, University of Alberta; Ross L. Watts, University of Rochester; Jerold L. Zimmerman, University of Rochester; and Mark E. Zmijewski, University of Chicago. Paul A. Griffin is Professor of Accounting at the University of California, Davis.

ROBERT W. MCGEE, *Accounting and Tax Aspects of Computer Software Manufacturing* (New York; Westport, CT; and

London: Praeger Publishers, a Division of Greenwood Press, Inc., 1987, pp. viii, 162, $35.95).

Six chapters examine the problem of accounting for software from both tax and financial accounting standpoints. In general, current accounting rules are not directly applicable to such accounting, while tax rules vary or are unclear. Part I considers financial accounting for computer software and capitalization of software as a possible solution. Federal tax aspects are evaluated in Part II, including the issues of investment and research tax credit as applicable to computer software. Part III discusses the state tax aspects of software, including the classification of software as tangible or intangible property. Robert W. McGee is Professor of Accounting and Taxation at the W. Paul Stillman School of Business, Seton Hall University.

MAURICE MOONITZ, *History of Accounting at Berkeley*, Occasional Paper (Berkeley, CA: Professional Accounting Program, Schools of Business, University of California, Berkeley, 1986, pp. 112, free).

Traces the history of the study of accounting at Berkeley, which ties the University of Chicago as the second oldest business school in the U.S. Berkeley also has the distinction of being the first institution to offer a full-time appointment in accounting (1904). Profiles of current and former faculty, including Henry Rand Hatfield, Charles C. Staehling, Perry Mason, and other well-known accounting academicians, are provided. Four appendices include a list of holders of the Doctor of Philosophy Degree, with a Specialization in Accounting; participants in the symposium on The Foundations of Financial Accounting, held at Berkeley in 1967; topics, principal speakers, and discussants of the Berkeley Professional Accounting Program Technical Sessions; and heads of the Accounting Group at the Berkeley Business School. Maurice Moonitz is Professor Emeritus of the University of California, Berkeley.

CYRIL R. TOMKINS, *Achieving Economy, Efficiency and Effectiveness in the Public Sector* (Edinburgh, Scotland: The Institute of Chartered Accountants of Scotland, 1987, pp. ix, 115, £5.00).

This volume focuses on the public sector and is the first study in the Institute's series on "Emerging Issues" which is designed to explain topical issues in accounting information. The book examines recent developments in public sector auditing and reviews in the context of management and accountability within the public sector. Five chapters consider the boundaries separating the private and public sectors; the experience of the U.K. in improving efficiency and effectiveness in the public sector; closing the effectiveness gap; who should be accountable for what and to whom; and planning and control in public sector organizations. Cyril Tomkins is Professor of Accounting and Finance in the School of Management at the University of Bath, England.

NANCY E. WELLS, *Straight Forward Managerial Accounting Applications Using Lotus 1-2-3* (Burlington, VT: Champlain College, Inc., 1986, pp. iii, 62, $10.95–academics, $12.95–others).

Manual discusses the use of the Lotus 1-2-3 spreadsheet package in solving problems based on the managerial and cost accounting concepts of break-even and cost/volume/profit analysis; the sales mix; contribution and functional income statements; flexible budgeting; and the master budget. Chapters one and two offer a brief introduction to the use of Lotus 1-2-3. Chapters three through seven cover the topics above, providing step-by-step guides to solving demonstration problems and an assignment to be solved using techniques discussed in the chapter. Nancy E. Wells is Assistant Professor of Accounting at Champlain College.

Editor's Note: Catherine McNally assisted the Editor in annotating these books.

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Brian Armitage, *Business Expansion Scheme*, Second Edition (London: Chartac Books, The Institute of Chartered Accountants in England and Wales, 1987, pp. xvii, 281, £14.95 paper).

Ahmed Belkaoui, *Quantitative Models in Accounting* (New York; Westport, CT; and London: Quorum Books, a Division of Greenwood Press, Inc., 1987, pp. xvi, 359, $55.00).

Jack N. Behrman, *Essays on Ethics in Business and the Professions* (Englewood Cliffs, NJ: Prentice Hall, 1988, pp. x, 358, $19.00 paper).

Herausgegeben von Silvia Bianchi mit Beitragen von Edgar Salin, Bruno S. Frey, and Silvio Bianchi, *Wieviel Mathematik brauchen die Sozialwissenschaften?* (Bern and Stuttgart: Verlag Paul Haupt, 1987, pp. 64).

Christopher Billy, Editor and Mark Geoffroy, Data Editor, *Peterson's Business and Management Jobs 1988* (Princeton, NJ: Peterson's Guides, Inc., 1987, pp. 291, $17.95 paper).

J. E. Boritz, B. G. Gaber, and W. M. Lemon, *An Experimental Study of Review of Preliminary Audit Strategy by External Auditors* (Toronto: The Canadian Academic Accounting Association, 1987, pp. x, 149, Can. $25.00 paper).

Business Support Group of the Institute of Chartered Accountants in England and Wales, *Guidance to Good Practice: Business Planning* (London: The Institute of Chartered Accountants in England and Wales, 1987, pp. 27, no charge first five copies, 85 pence each additional copy-paper).

Canadian Institute of Chartered Accountants, *Accounting and Financial Reporting by Venture Capital Organizations* (Toronto: The Canadian Institute of Chartered Accountants, 1987, pp. 75, Can. $27.50 paper).

Canadian Institute of Chartered Accountants, *Personal Financial Statements* (Toronto: The Canadian Institute of Chartered Accountants, 1987, pp. 74, Can. $22.50 paper).

Andrew D. Chambers, Georges M. Selim, and Gerald Vinten, *Internal Auditing*, Second Edition (London: Pitman Publishing, 1987, pp. viii, 439, £17.95).

D. J. Chapman and W. R. Packer, *Practical Partnership Taxation* (London: Chartac Books, The Institute of Chartered Accountants of England and Wales, 1987, pp. 124, £14.95).

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Frederick D. S. Choi and Kazuo Hiramatsu, *Accounting and Financial Reporting in Japan* (Berkshire, England: Van Nostrand Reinhold (UK) Co. Ltd., 1987, pp. xiii, 276, $49.95).

Morris H. DeGroot, Stephen E. Fienberg, and Joseph B. Kadane, *Statistics and the Law*, Wiley Series in Probability and Mathematical Statistics (New York; Chichester, England; Brisbane; Toronto; and Singapore: John Wiley & Sons, 1986, $39.95).

Financial Accounting Standards Board, "Sale and Leaseback Transactions Involving Real Estate, Sales-Type Leases of Real Estate, Definition of the Lease Term, and Initial Direct Costs of Direct Financing Leases," *Financial Accounting Series Exposure Draft of a Proposed Statement of Financial Accounting Standards*, an amendment of FASB Statements 13, 66, and 91 and a rescission of FASB Statement No. 26 and Technical Bulletin No. 79-11, August 31, 1987 (Stamford, CT: Financial Accounting Standards Board, 1987, pp. 41, $115.00 one year subscription-paper).

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William M. Fox, *Effective Group Problem Solving* (San Francisco and London: Jossey-Bass, Inc., 1987, pp. xvii, 204, $21.95).

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William D. Hall, *Accounting and Auditing: Thoughts on Forty Years in Practice and Education* (Chicago: Arthur Andersen & Co., 1987, pp. 81, no charge to academics).

Kempe Ronald Hope, *Development Finance and the Development Process: A Case Study of Selected Caribbean Countries* (New York; Westport, CT; and London: Greenwood Press, Inc., 1987, pp. xi, 100, $27.95).

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Kenneth S. Most, Editor, *Advances in International Accounting*, A Research Annual, Volume I (Greenwich, CT and London: JAI Press Inc., 1987, pp. xiv, 404, $29.75 individials, $59.50 institutions).

Thornton L. O'Glove, *Quality of Earnings* (New York and London: The Free Press, a Division of Macmillan, Inc., 1987, pp. xviii, 204, $18.95).

James A. Ohlson, *The Theory of Financial Markets and Information* (New York, Amsterdam, and London: North-Holland; distributed in North America by Elsevier Science Publishing Company, Inc., New York, 1987, pp. xiii, 181, $38.95).

Bill Packer, "A Guide to the Finance Act 1987," *Accountants Digest No. 207*, Summer 1987 (London: The Institute of Chartered Accountants in England and Wales, pp. 32, £7.50 paper).

Ralph P. Ray, "Wills and Post-Death Planning," *Accountants Digest No. 209*, Autumn 1987 (London: The Institute of Chartered Accountants in England and Wales, pp. 44, £7.00 paper).

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Dan A. Simunic and Michael T. Stein, *Product Differentiation in Auditing: Auditor Choice in the Market for Unseasoned New Issues* (Vancouver, British Columbia: The Canadian Certified General Accountants' Research Foundation, 1987, pp. x, 71, Can. $11.00 paper).

F. A. Smith and J. C. Skates, "P11Ds, P9Ds and the Employer" *Tax Digest No. 59*, Summer 1987 (London: The Institute of Chartered Accountants in England and Wales, 1987, pp. 72, £8.00 paper).

Peter Souster, "Directors' Responsibilities—Following the Insolvency Legislation of 1986," *Accountants Digest No. 206*, Summer 1987 (London: The Institute of Chartered Accountants in England and Wales, 1987, pp. 36, £6.50 paper).

Cyril R. Tomkins, *Achieving Economy, Efficiency and Effectiveness in the Public Sector* (Edinburgh, Scotland: The Institute of Chartered Accountants of Scotland, 1987, pp. ix, 115, £5.00 paper).

David Tweedie and Geoffrey Whittington, *The Debate on Inflation Accounting* (Cambridge, England; London; New York; New Rochelle, New York; Melbourne; and Sydney: Cambridge University Press, 1984, pp. xxii, 404, $52.50).

Grace W. Weinstein, *The Bottom Line: Inside Accounting Today* (New York and Scarborough, Ontario: New American Library, 1987, pp. 233, U.S. $19.95, Can. $27.95).

Nancy E. Wells, *Straight Forward Managerial Accounting Applications Using Lotus 1-2-3* (Burlington, VT: Champlain College, Inc., 1986, pp. iii, 62, $10.95-academics, $12.95-others).

1988 Distinguished International Visiting Lecturers in Accounting

Andre Zund

Alvin A. Arens

The American Accounting Association is pleased to announce the selection of its 1988 Distinguished International Visiting Lecturers in Accounting. Andre Zund, Professor of Accounting and Auditing at the Saint Gall Graduate School, St. Gallen, Switzerland, was selected as the Distinguished Lecturer to visit schools in the United States and Canada in February and March of 1988. Alvin A. Arens, Price Waterhouse Auditing Professor at Michigan State University, was selected as the professor from the United States or Canada to visit educational institutions in the People's Republic of China, Singapore, Malaysia, Thailand, and Indonesia.

The American Accounting Association is appreciative of the financial support this program receives from Exxon Corporation and Ford Motor Company Fund. This program was started with an Exxon Controller's Grant in 1975. In 1987, the Exxon Controller's Grant in the amount of $4,000 and the contribution from the Ford Motor Company Fund in the amount of $3,500 were used by the Association to provide financial support connected with this program. Under the Distinguished International Visiting Lecturer in Accounting Program, a Distinguished Professor from the United States or Canada lectures for several days at eight or nine universities in certain areas of the world and a Distinguished Professor from abroad lectures for two days at each of eight universities in the United States and Canada.

The American Accounting Association's International Faculty Exchange Committee, which makes the selections of the distinguished professors and universities to be visited, is appointed by the President of the American Accounting Association.

Andre Zund will serve as the Distinguished International Visiting Lecturer who will visit the United States and Canada during 1988. He will visit the following universities: Seton Hall University; The University of Tennessee; University of Washington; University of Florida; University of South Florida; Miami University; Case Western Reserve University; and University of Waterloo.

Andre Zund has been a member of the American Accounting Association since 1978 and is also a member of the European Accounting Association. He served as President of the European Accounting Association in 1984–1985. In addition to being a Swiss certified public accountant, Professor Zund has served as chairman and member of different committees of the Swiss Institute of Accountants. He is serving as Professor of Accounting and Auditing at Saint Gall Graduate School, St. Gallen, Switzerland. Other activities include serving as president and member of the board of four companies and serving as Swiss delegate at the OECD and UN Working Groups on Accounting and Reporting. He has also been an independent practicing consultant since 1971. Previous employment included public accounting, service at the World Bank in Washington, DC, and as Head of Internal Auditing and Tax Consultant for F. Hoffmann-La Roche & Co. AG, Basel, Switzerland.

Andre Zund is the author of four books and 114 articles on financial, accounting, and auditing topics. Topics of his lectures during his 1988 lecture tour to the United States and Canada will include "The Role of OECD and UN in International Harmonization of Accounting and Reporting," "International Harmonization of Accounting and Reporting from a European Point of View," "Accounting in Switzerland," and "Auditing in Switzerland."

Alvin A. Arens is the Price Waterhouse Auditing Professor at Michigan State University. He received his BBA, MBA, and Ph.D. from the University of Michigan and is a CPA in Minnesota. He spent four years in public accounting and then taught at the University of Minnesota and Augsburg College in Minneapolis. He came to Michigan State University in 1968, where he has remained through the present time.

Alvin Arens joined the American Accounting Association in 1968 and has been an active member of the Association. In addition to many committee activities, he served as Chairman of the Association's Auditing Section in 1977–1978, and was a member of Council and Secretary/Treasurer of the American Accounting Association from 1983 until 1985. He is an author or co-author of thirteen books and numerous articles and proceedings papers. As one of the American Accounting Association's Distinguished International Visiting Lecturers in Accounting, he will lecture at the following universities: Nanyang Technological Institute (Singapore); Universiti Pertanian Malaysia; University of Indonesia; and Chulalongkorn University (Thailand). In China: Zhongnan University of Finance & Economics; Shanghai University of Finance & Economics; The People's University of China; and Southwestern University of Finance & Economics.

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APRIL 1988 PLACEMENT ADS

The deadline for information to be included in the "Placement Information" section is two months prior to the date of publication. The Review *is published on the first day of January, April, July, and October. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399. ATTENTION: ADVERTISING DEPT. All replies to box numbers should be on separate sheets to facilitate forwarding. There is no charge for this service to AAA members and associate members seeking employment. Others will be charged a fee of $100 per insertion. ADS SHOULD NOT EXCEED 100 WORDS.*

#201 CORPUS CHRISTI STATE UNIVERSITY is seeking applications for a tenured-track position in accounting beginning Fall 1988. Rank and salary are open depending upon qualifications. Ph.D. or DBA in accounting is required (ABD's will be considered), professional certification is preferred. The University places a balanced emphasis on teaching and research. Send resumé to Professor W. F. Rylander, Accounting Search Committee, Corpus Christi State University, 6300 Ocean Drive, Corpus Christi, Texas 78412. An Affirmative Action/Equal Opportunity Employer.

#202 TULANE UNIVERSITY, The A. B. Freeman School of Business is seeking a research-oriented faculty member in financial accounting or managerial accounting to fill a tenure-track position. Salary and benefits are highly competitive. A proven publication record is required for senior ranks. Please send resumé to Soliman Y. Soliman, Ph.D., Area Coordinator—Accounting and Taxation, A. B. Freeman School of Business, Tulane University, New Orleans, Louisiana 70118-5669. Tulane University is an Equal Opportunity/Affirmative Action Employer.

#203 THE UNIVERSITY OF MARYLAND European and Asian Divisions seek excellent teachers for undergraduate courses on U.S. military bases overseas. Minimum requirements include a master's in accounting, one year of recent college teaching experience, and U.S. citizenship. Renewable annual appointments begin August 1988. Excellent for a sabbatical or leave of absence. Benefits include transportation and military base privileges. Frequent travel and the cost of schooling make these positions difficult for those with children. Send resumé to Dr. Ralph E. Millis, the University of Maryland University College, College Park, MD 20742-1642. AA/EEO.

#204 SUFFOLK UNIVERSITY, Boston, MA. The Accounting Department anticipates FT tenure-track position openings for 9/1/88 at UG/G levels in managerial and/or financial areas with secondary interests in accounting information systems or auditing. PhD/DBA in Accounting and evidence of effective teaching, research and a strong publication record required. CPA, CMA or other certification(s) desirable. Apply to Ronald Sundberg, Associate Dean, School of Management, Beacon Hill, Boston, MA 02108 or call (617) 573-8301. An equal opportunity, affirmative action employer.

#205 THE DIVISION OF ADMINISTRATION-UNIVERSITY OF NEW BRUNSWICK, Saint John, New Brunswick, Canada, invites applications for a full-time tenure-track position in Financial Accounting commencing July 1, 1988. Rank and salary commensurate with qualifications and experience. Ph.D. or equivalent required—candidate with a strong background in Information Systems preferred but candidates with lesser qualifications may be considered for a term appointment. Send c.v. and names of three referees to Dr. Peter McGahan, Dean of Faculty, University of New Brunswick, Box 5050, Saint John, New Brunswick, Canada E2L 4L5. In accordance with Canadian Immigration Regulations, preference will be given to citizens and permanent residents of Canada.

#206 CALIFORNIA STATE UNIVERSITY, LOS ANGELES is accepting applications from candidates for Assistant, Associate and Full Professor positions for 1988–1989. Tenure-track and one-year appointments are available. Tenure-track positions normally require a doctorate or ABD, except in taxation which requires a J.D. or MBT. Candidates should be able to demonstrate teaching effectiveness and research capabilities. The Department's strongest needs are for persons who can teach financial accounting (under-graduate and graduate). California State University, Los Angeles is an Equal Opportunity/Affirmative Action Employer. Interested candidates are invited to submit their curriculum vitae to Gary V. Jorden, Chair, Department of Accounting, California State University, Los Angeles, CA 90032.

#207 ACCOUNTING POSITION WANTED: DBA, CPA, 10 years of university experience. Major publications. Teaching areas are Financial Accounting/Auditing. Looking for institution which emphasizes research and professional productivity. Available May, 1988.

#208 KNOX COLLEGE. Tenure-track position in accounting plus some combination of finance and managerial economics or related areas including industrial organization or monetary economics. Assistant or associate professor. Doctorate preferred; ABD possible. Starting date negotiable: full- or part-time during 1988–1989; full-time after September 1, 1989. Salary open. Teaching responsibilities include two-term sequence in accounting; other courses depend on the interests of the individual. Six courses per year. Candidate must be interested in teaching in a liberal arts college. Send curriculum vitae and references, or requests for additional information, to Professor Mary L. Eysenbach, Chair, Department of Economics and Business Administration, Knox College 37, Galesburg, IL 61401-4999. AA/EOE.

#209 CALIFORNIA STATE UNIVERSITY, FULLERTON invites applications for tenure-track and temporary appointments in Accounting. Candidates must have a doctorate in Accounting or be near completion of dissertation. A strong commitment to teaching and research is expected. The School of Business is accredited by AACSB at the undergraduate and graduate levels. Rank and salaries are competitive and commensurate with professional experience and qualifications. Send applications to Keith W. Lantz, Chairman, Department of Accounting, California State University–Fullerton, Fullerton, CA 92634. Telephone 714-773-2225. CSUF is an Affirmative Action, Equal Opportunity Employer.

#210 THE UNIVERSITY OF TOLEDO, Department of Accounting, invites applications for positions in taxation effective September, 1988. Candidates should possess a doctorate with a specialty in accounting and/or taxation. Persons holding the combination of JD, MBA, CPA will also be considered. Salary is very competitive. The University of Toledo has an enrollment of approximately 20,000 students. The Accounting Department offers an undergraduate degree in accounting, as well as a Master of Science in Accounting degree and the MBA. A Master of Taxation degree program is presently in the authorization process and should be under way in September, 1988. Send vita to: Dr. Larry F. Konrath, Chairman, Department of Accounting, The University of Toledo, Toledo, Ohio 43606. An Equal Opportunity/Affirmative Action Employer.

#211 THE SCHOOL OF PROFESSIONAL ACCOUNTANCY, UNIVERSITY OF SOUTHERN MISSISSIPPI, invites applications for two tenure-track positions beginning August, 1988. Rank will be dependent on qualifications. The normal teaching load of twelve semester hours is reduced for graduate courses and research. Qualifications: A Ph.D/D.B.A. in accounting and a good research record. A CPA, CMA, or CIA is desirable. U.S. Citizenship or permanent residence status is required. The College of Business Administration is fully accredited by the American Assembly of Collegiate Schools of Business and the Undergraduate Accounting Program is separately accredited by the AACSB. AA/EOE. Contact: Director, School of Professional Accountancy, Southern Station Box 5178, Hattiesburg, MS 39406-5178.

#212 BOSTON UNIVERSITY—The School of Management at Boston University anticipates full-time, tenure-track faculty positions and part-time faculty positions for September 1, 1988 in Accounting, Finance/Economics, Marketing, Management Information Systems, Operations Management, Quantitative Methods and Management Policy. We require a Ph.D., D.B.A., or A.B.D., proven or potential capability in research in the field and the qualification to teach at the undergraduate, master's, and/or doctoral levels. Rank and salary are contingent upon experience and qualifications. Interested applicants should send resumés to: John F. Mahon, Associate Dean, Boston University, School of Management, 685 Commonwealth Ave., Rm. 118, Boston, MA 02215. Boston University is an Equal Opportunity, Affirmative Action employer.

#213 MBA, CPA 19 years accounting experience, 10 years teach, 6 years full-time SEEKS: Full-time tenure-track position, New York Metropolitan areas. A position which would not require doctorate for tenure. Box 3194, Scarsdale, NY 10583.

#214 Applications are invited for candidates with Ph.D/D.B.A. in Accounting for the areas of Management Information Systems and Financial Accounting. Tenure-track positions at Assistant/Associate rank. Teaching experience preferred. Must have commitment to research. Position begins 9/1/88; selection process begins immediately and continues until filled. Applications will not be considered by Search and Screen Committee until all required materials are received. Send resumés, transcripts, and names of three references to: Search and Screen Committee, College of Business and Management, Northeastern Illinois University, 5500 N. St. Louis, Chicago, Illinois 60625. AA/EOE.

#215 THE UNIVERSITY OF CALGARY invites applications for Chartered Accountants' Professorship in Accounting. This position, created by The University of Calgary with support received from the Accounting Education Foundation of Alberta, is intended to attract an outstanding individual to provide leadership in enhancing the quality of accounting education in the Faculty of Management. In addition to the demonstrated record of scholarly achievement expected for appointment to the rank of Full Professor, the candidate must demonstrate a dedication to curriculum development in the field of accounting. In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. Applications should be addressed to Dr. J. R. Brent Ritchie, Associate Dean (Research and Development), Faculty of Management, The University of Calgary, 2500 University Drive N.W., Calgary, Alberta T2N 1N4.

#216 COLUMBIA UNIVERSITY, Department of Economics invites applications for a junior position to teach Accounting to undergraduate and graduate students in the School of Public and International Affairs. Candidates are expected to possess a doctoral degree. If the degree is in Economics the rank will be Assistant Professor, otherwise the rank will be Lecturer. Applicants must have a proven record in teaching. Please send vita to Arnold Collery, Chairman, Department of Economics, Columbia University, School of International and Public Affairs, New York, New York 10027. Columbia University is an affirmative action equal opportunity employer.

#217 POSITION WANTED: Ph.D. in Accountancy; 25 years of teaching experience; modest publications; desire position to teach mainly management/cost accounting in an AACSB school with commitment to excellence in teaching.

#218 INTERESTED IN A CAREER IN ACCOUNTING OR FINANCIAL ACCOUNTING IN AUSTRALIA? Australia's leading business school, The Australian Graduate School of Management, has a senior position available up to Chaired Professorial level and an appropriate salary would be negotiated. A strong research orientation and capability is essential. Teaching centres around MBA and PhD courses and supervision of PhD candidates. Please send CV, names of referees and teaching evaluations (if available) to Professor Peter L. Swan, AGSM, University of NSW, P.O. Box 1, Kensington, NSW 2033, Australia. Tel. 61-2-6620269.

#219 THE UNIVERSITY OF MANITOBA is seeking applicants for tenure-track positions in accounting for July 1988. Rank is open, based on qualifications and experience. A visiting appointment is also possible. Ph.D. or DBA, completed or near completion is required. Duties include research and teaching at the undergraduate and graduate levels. Salary is competitive and will depend on qualifications, experience and research record. Winnipeg, a multicultural city of 600,000, offers the best of an urban environment in the heart of Canada's vacation land. Both women and men are encouraged to apply. In accordance with Canadian immigration requirements, priority will be given to qualified Canadian citizens and permanent residents of Canada. Applications should be sent to: Dr. L. I. GOULD, HEAD, DEPARTMENT OF ACCOUNTING AND FINANCE, UNIVERSITY OF MANITOBA, WINNIPEG, MANITOBA, R3T 2N2.

#220 Professor Accounting and Business Finance, currently Dean of Faculty, seeks Visiting Professorship in a reputable University. Nearly twenty years undergraduate/postgraduate quality teaching/research experience with impressive publications. Will respond to all genuine enquiries. Available after August 1988.

#221 COLLEGE OF WILLIAM AND MARY invites applications for a visiting position in Accounting for the 1988–1989 academic year. Candidates must have or be completing a Ph.D. or D.B.A. degree. The College of William and Mary is a state-supported, small-scale university with average SAT scores of over 1200. The accounting program is accredited by AACSB. Send resumé to James E. Smith, Director of the Accounting Program, School of Business Administration, College of William and Mary, Williamsburg, VA 23185. AA/EOE. Minorities and women are encouraged to apply.

#222 THE UNIVERSITY OF NORTHERN IOWA, School of Business, Department of Accounting, is seeking candidates for two permanent positions in accounting. The candidate should be prepared to teach M.B.A. students and advanced courses. The School of Business provides an environment of warm collegial relationships coupled with a high degree of professionalism. The university is located in a prosperous metropolitan area of 130,000 with abundant opportunities for executive development and consulting. Salary competitive. The University of Northern Iowa is an affirmative action employer. Women, minorities and other members of protected classes are encouraged to apply. Send current vita to Dr. Gaylon Halverson, Head, Department of Accounting, School of Business, University of Northern Iowa, Cedar Falls, IA 50414-0127.

#223 THE UNIVERSITY OF PUGET SOUND School of Business and Public Administration invites applications for a tenure-track position in Accounting to begin September 1988 or January 1989. Assistant or Associate Professor preferred; salary commensurate with education and experience. Teach intermediate and advanced financial and/or managerial accounting courses; some introductory courses also required. Ph.D. or D.B.A. in Accounting, and commitment to undergraduate teaching required. Preference will be given to applicants with a C.P.A., C.I.A. or C.M.A. certificate, prior college level teaching experience and related work experience. ABD's near completion will be considered. Send vita and names of references to: Accounting Search, University of Puget Sound, P.O. Box 7297, Tacoma, WA 98407. An Equal Opportunity, Affirmative Action Educator/Employer.

#224 LOUISIANA TECH UNIVERSITY, Ruston, Louisiana. The School of Professional Accountancy invites applications for faculty positions at the associate and full professor ranks beginning in the 1988–1989 academic year. The positions require individuals with established research and publication records and a strong interest in graduate programs. The PhD is required with professional certification desirable. Very competitive salaries offered. Contact Dr. James G. Johnston, Director, School of Professional Accountancy, Louisiana Tech University, Ruston, LA 71272 or telephone 318-257-2822. Louisiana Tech University is an Affirmative Action employer.

#225 THE UNIVERSITY OF CALGARY, Faculty of Management invites applications for tenure-track positions commencing Winter 1988 or Fall 1988. Positions are available in auditing, financial and managerial accounting. Candidates should have a Ph.D., or DBA with a major in accounting. ABD's in advanced dissertation stage will be considered. Normal teaching load is six hours per term. Computer assistance and research support are available. In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. Applications should be addressed to Dr. J. R. Brent Ritchie, Associate Dean (Research and Development), Faculty of Management, The University of Calgary, 2500 University Drive N.W., Calgary, Alberta, T2N 1N4.

#226 Tax Partner, National Firm—Audit and Tax Experience with Big 8 Firms—Former Associate Professor, Major University—Desires return to Educational Field—Heavy in CPE Design Instruction and Maintenance—MBA/CPA—Age 46.

#227 THE DEPARTMENT OF ACCOUNTING, THE UNIVERSITY OF TEXAS AT AUSTIN is recruiting at all academic ranks, for appointments starting September 1, 1988. Applicants should have superior records in Ph.D. or D.B.A. programs and potential for excellence in teaching and research. Salaries and fringe benefits are competitive. Submit vita, academic transcripts, references, and samples of research to Dr. Michael H. Granof, Chairman, Department of Accounting, CBA 4M. 202, The University of Texas, Austin, TX 78712-1172. The University of Texas at Austin is an Equal Opportunity Employer.

#228 WESTERN ILLINOIS UNIVERSITY seeks candidate with doctorate (ABD considered) or JD and CPA/CMA for tenure-track position, starting August 15, 1988, to teach at the Rock Island Regional Undergraduate Center. This newly approved program will involve two full-time positions at that location; one in accounting and one in management. Possibility of a ten- or eleven-month contract with some program coordinating duties. Willingness to work with the accounting community required in addition to teaching and research. Rank and salary dependent upon qualifications. WIU's business programs are AACSB accredited (graduate and undergraduate). WIU is an AA/EO employer. Women, minorities and handicapped persons are especially encouraged to apply. Applications will be accepted until the position is filled. Send resumé to Professor Penelope J. Yunker, Chair, Department of Accountancy, Western Illinois University, Macomb, Illinois 61455.

#229 NORTH DAKOTA STATE UNIVERSITY, tenure-track position in accounting, Fall, 1988. Teaching specialty open. Candidates should hold a doctorate in accounting or ABD in accounting nearing completion. Certification desirable. Responsibilities: quality teaching, research, and service. Teaching load: seven courses (quarter system) per academic year. Salary is competitive. Application deadline is May 27, 1988. Send letter, resumé and three references to: John H. Scheibelhut, Dean, College of Business Administration, North Dakota State University, P.O. Box 5137, Fargo, ND 58105. North Dakota State University is an Equal Opportunity Institution.

#230 ACCOUNTING. Two tenure-track positions will be available at the University of South Carolina at Aiken, beginning Summer or Fall, 1988. Emphasis is on quality teaching, primarily at the junior and senior level, and active scholarship. Ph.D. or near completion, as well as experience and certification, preferred. Rank and salary competitive and will be determined by qualifications and experience. An opportunity to join a small but growing faculty and to contribute to program development. Applications accepted until position is filled. Send letter of application, graduate transcripts and three letters of recommendation to Dr. Don Mitchem, Head, School of Business and Economics, USC at Aiken, 171 University Parkway, Aiken, SC 29801. An Affirmative Action/Equal Opportunity Employer.

#231 EASTERN NEW MEXICO UNIVERSITY announces two tenure-track positions in Accounting at the Assistant/Associate Professor rank. Ph.D. or DBA with CPA or CMA preferred. Responsibilities: teaching courses in Financial Accounting at graduate/undergraduate levels, advising, registration, faculty meetings, commencement experiences and other duties assigned by Dean. Position pending funding. Send letter of application, professional resumé, academic transcripts and three letters of recommendation to Dr. Leslie R. Loschen, Chair, Department of Accounting/Computer Information Systems, ENMU, #49, Portales, NM 88130. ENMU hires only U.S. citizens and aliens lawfully authorized to work in the U.S. and is an AA/EOE.

#232 UNIVERSITY OF MISSOURI-ST. LOUIS has tenure-track positions in accounting for fall 1989, rank and salary dependent on qualifications. Candidates in tax, financial accounting, governmental accounting, or systems preferred. Quality research and teaching expected. Candidates should possess a Ph.D/DBA. Professional certification desirable. Senior appointment requires strong publication record. Campus enrollment is 11,000 students with approximately 3,000 enrolled in AACSB-accredited undergraduate and masters business programs. Pleasant suburban location. Send resumé to Professor Silvia Madeo, School of Business Administration, University of Missouri -St. Louis, 8001 Natural Bridge Road, St. Louis, Missouri 63121-4499. An affirmative action, equal opportunity institution.

#233 ACCOUNTING: Two tenure-track positions beginning in September, 1988. One position at rank of Professor and the other Associate or Assistant Professor. All applicants should have a doctorate or be ABD with dissertation nearing completion. CPA and/or CMA preferred. The applicants must have a recent record or scholarly productivity and be capable of handling a variety of teaching assignments in the general areas of financial accounting, auditing, cost, systems and tax. Apply to Dr. Emerson Erb, School of Business and Public Administration, California State University-Bakersfield, 9001 Stockdale Hwy., Bakersfield, CA 93311-1099. CSB is an AA/EOE. Closing date is March 15, 1988, or until filled.

#234 DEPAUL UNIVERSITY'S SCHOOL OF ACCOUNTANCY invites applications from highly qualified candidates for tenure-track positions in Financial Accounting, Auditing, and MIS. Rank and salary commensurate with qualifications and experience. Doctorate preferred for all positions; ABD within one year of completion will be considered. Evidence of consistent teaching excellence and scholarly capabilities and accomplishments are essential. Research support is extensive. The School is fully accredited by the AACSB, is an FSA charter member, and offers three undergraduate and five graduate programs to 1500 accounting students. Located in Chicago's commercial district, DePaul offers significant research and professional opportunities. Please contact Dr. John T. Ahern, Jr., Director, School of Accountancy, DePaul University, 25 E. Jackson Blvd., Chicago, IL 60604. DePaul is an EEO employer.

#235 THE UNIVERSITY OF SOUTH DAKOTA invites applicants for tenure-track Accounting openings beginning August, 1988. The School of Business offers BS, MBA, and Master of Professional Accountancy Degrees. Doctorate required for promotion and tenure. Advanced ABD's will be considered. CPA is desirable. The University of South Dakota is an equal opportunity/affirmative action employer. Send resumé to Philip Fisher, Associate Dean, School of Business, University of South Dakota, Vermillion, SD 57069.

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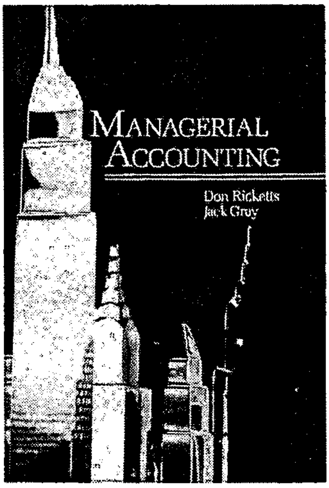

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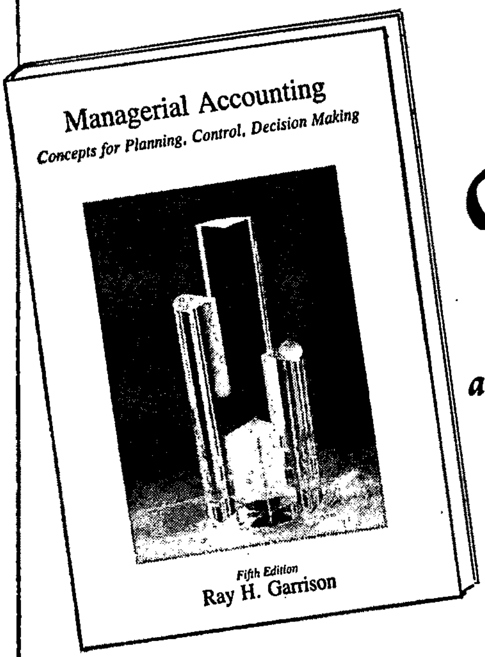

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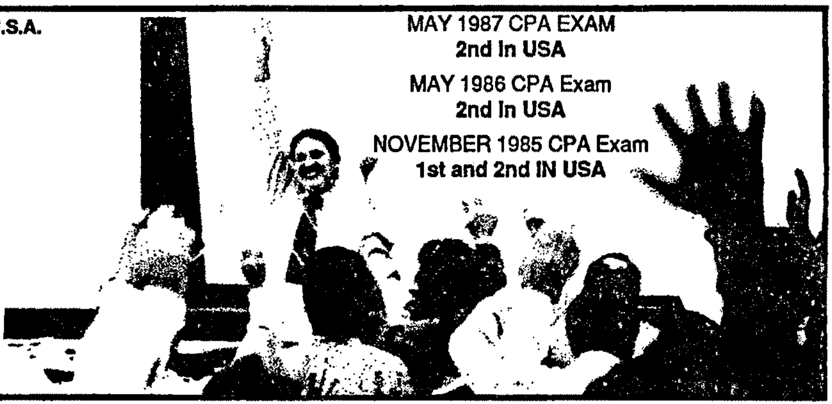

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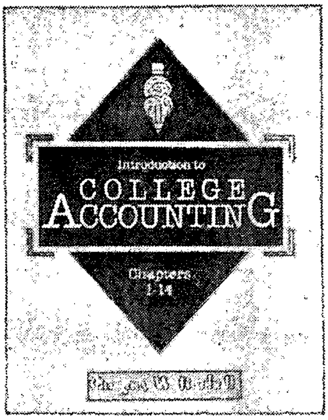

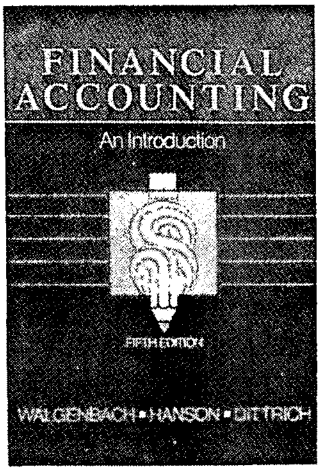

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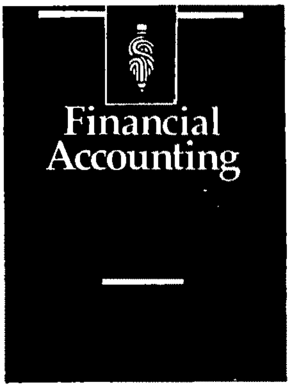

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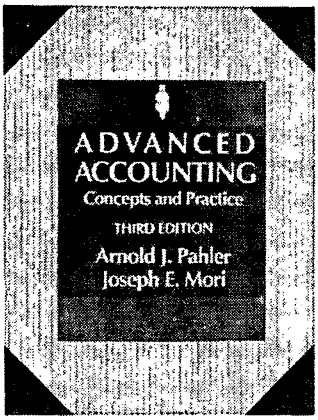

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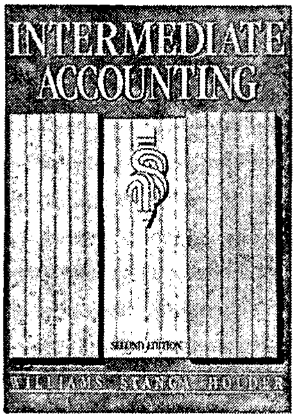

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